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DERMOID CYSTS OF THE OVARY: THEIR CLINICAL AND PATHOLOGIC SIGNIFICANCE*

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TO MANY the term "ovarian dermoid" cyst denotes merely a ball of hair invested by a mantle of ectodermal tissue occasionally supporting one or more teeth. Careful examination, however, frequently reveals a variety of tissues including bone, cartilage, smooth muscle, fat, and so forth, all of which make rather indefinite the dividing line between this type of tumor and members of the more complex teratoma group. Although many papers have been published on ovarian dermoids, these contributions to the medical literature have, for the most part, been based on a study of a single case or a small series of cases.^{4, 18, 21, 25} With the feeling that a review of a large group of these tumors might produce some valuable information, the present study was undertaken with the following questions in mind: namely, what are the usual histologic components of the tumors and how many tumors are truly monodermal? Are the symptoms and signs produced diagnostic of the tumor type? What is the incidence and what are the types of malignant transformation seen in ovarian dermoids?

Historical Data

Except for one outstanding article by Pauly²² in 1875, a review of the literature reveals a surprising lack of historical material on such an important

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subject as dermoid cysts of the ovary. The following depicts in more or less chronologic order the data obtained from an extensive review of the writings on this subject.

One of the earliest medical records of a dermoid cyst of the ovary was made by Johannes Scultetus²⁷ in 1659. His notes and illustrations of a necropsy are said to be convincing evidence that he was describing such a tumor. Lebert¹⁶ is credited with first applying the term "dermoid cyst" to all cysts lined by a structure resembling skin, but in 1831 Leblanc¹⁷ had described what he called a "kyste dermoid" at the base of the skull of a horse. Kohlrausch,¹⁴ in 1843, had described the microscopic appearance of a "kyste dermoid," drawing attention to the analogy of its structure to that of the skin, so that when Lebert published his work in 1853, he had but one step to take to apply the term "dermoid cyst" to this entire group of neoplasms.

From gross examination, it was long evident that these cysts usually contain hair and frequently teeth and bone, but sudoriferous glands were not described until 1843 by Kohlrausch. Ten years later, Gray¹⁰ noted nerve fibers and ganglion cells, unaware that Steinlin²⁸ had discovered nerve tissue in a dermoid cyst three years previously. In 1859, Virchow²⁹ found a cerebellum-like structure. He is also credited with discovering smooth muscle fibers which he considered as "arrectores pilorum." Virchow has been quoted as having found striated muscular fibers in dermoid cysts of the ovary, but Pauly read the original articles of Virchow to find that, although striated muscle was described, the cysts were not dermoid in character.

In 1860, Salter²⁵ found nerve in the pulp of the teeth in these tumors. In the same year Heschl¹² reported several pieces of bone connected by a false joint lined by periosteum. In 1888, Bland Sutton⁴ found well-developed mammary glands, and in 1890, Pommer²³ described tissues resembling cecum and appendix. By 1895, Wilms³⁰ had written of thyroid tissue in a dermoid cyst. In 1906, Schottlaender²⁶ called attention to the frequent association of corpus luteum cysts in the walls of dermoids and stated that these were frequently overlooked. Boyd⁶ has found a well-developed adrenal in one of these neoplasms. Kordi¹⁵ recognized a lens and eyelid. Key¹³ found salivary glands near the maxillary bone which occurred in a dermoid, and Wilms³¹ described a rudiment of lung.

Etiology

Many hypotheses have been advanced to explain the origin of these tumors, and some of them will be listed: hair eaten by the patient and localized to the ovary; nightmares; witchcraft; a judgment of the Deity on immoral practices; unsatisfied sexual longings; metaplasia of Pflüger's tubules; extrauterine or ovarian pregnancies; inclusion of external integument; Graafian follicles; degeneration of a fertilized ovum; imperfect or diseased tubes incapable of receiving an ovum; cell rests; production of secondary embryonic site in the primitive streak; fertilization of primordial ovum in a growing embryo; misplaced blastomere; parthenogenetic development of ovum.

Many of these explanations appear to be ridiculous and others may or may not be correct. It was formerly held that these cysts resulted from a fertilized ovum and many young girls were falsely charged with social transgressions until Baillie³ published his belief that there need be no previous connection with a male and that these tumors "arise from some action within the ovarium itself which is imitative of generation." Cohnheim⁷ expressed the belief that there are numerous embryonal tissues not utilized during development and these may give rise to all types of neoplastic formations. The teratoma is one of the strongest arguments in support of this hypothesis.

Most of the discussion today centers around the last two listed hypotheses. Bonnet⁵ has shown that, if an ovum is agitated, a blastomere can become dislodged and result in the formation of a potential second individual. Also in the process of segmentation, cell elements may wander or become displaced to develop later after a period of quiescence. Murray²⁰ transplanted the blastoderm of the chick. He found that when the entire blastoderm was grafted, the degree of histologic differentiation was comparable to that found in normal chicks of an equivalent age, but when partial grafts were used, the degree of differentiation fell short of this and appeared similar to that of teratomas. Holtfreter^{12,a} killed all the cells of a morula of Triton except four and kept these alive in modified Ringer's solution. In nine days, the four cells had produced an irregular elongated body not unlike a teratoma. The following tissues were present: epidermis, nervous tissues, skeletal muscle, a piece of notochord, and an otic vesicle. This evidence firmly supports the blastomere hypothesis but should there be such a predilection for these to be present in the ovary? One would expect to find the cystic teratomas indiscriminately throughout the entire body.

Parthenogenesis or asexual reproduction has been observed in lower animals. Pricking the ovaries of a frog with a needle sometimes results in the development of complicated teratomas. It is recognized that these tumors occur during the period of functional activity of the ovaries. If, however, it was possible for a teratoma to spring from an unimpregnated egg, one would expect a much greater frequency of these tumors, especially in the tube, than has been observed. Less than twelve have been reported. This would account for the great preponderance of these tumors in the ovary.

The experimental production of ovarian dermoids has not been accomplished in warm-blooded animals. However, Michalowsky,¹⁹ Bagg,² Falin,⁸ and Falin and Grómszewa⁹ have produced neoplasms of comparable structure in the testes of the adult rooster using zinc chloride and zinc sulfate as the initiating agents. Age and seasonal variations in sexual activity appeared to act as modifying influences in the success of their experiments, the interpretation of which, as related to the origin of ovarian dermoids, is at present obscure.

The number of hypotheses advanced to explain the origin of these neoplasms merely confirms the fact that knowledge concerning their cause is still conjectural.

Material and Methods

For the purpose of this study, the records in 225 consecutive cases of dermoid cysts of the ovary removed at operation in the Mayo Clinic were reviewed. One hundred consecutive tumors of this group were examined macroscopically, and from ten to fifteen sections were removed from the cyst wall for microscopic study. In a few instances, the size of the tumor permitted the selection of only two to five sections, but in every cyst, these sections were taken at scattered areas in order that the structures of the cyst wall should be well represented. These tissues were routinely stained with hematoxylin and eosin. To

demonstrate mucus, the Galantha mucus stain was used. Many of the sections contained bone or calcium and for these the Galantha method for rapid decalcification was employed. To demonstrate myelin sheaths of nerves, the Bodian stain was chosen.

Results

Incidence.—The incidence of dermoids is usually stated to be about 10 per cent of all ovarian neoplasms, but the incidence in this series was only about 5 per cent. There was no predilection for either ovary. Twelve and four-tenths per cent were bilateral (Table I).

TABLE I. LOCATION OF DERMOID CYSTS

LOCATION	NUMBER	PER CENT
Right ovary	99	44.0
Left ovary	96	42.7
Bilateral	28	12.4
Unrecorded	2	0.9

TABLE II. INCIDENCE AS TO AGE

AGE (YEARS)	TUMORS
6-10	3
11-15	1
16-20	6
21-25	15
26-30	32
31-35	36
36-40	38
41-45	38
46-50	27
51-55	23
56-60	14
61-65	8
66-70	10
71-75	2

These cysts were found in patients of all ages (Table II), but no proof was forthcoming that they arose after the menopause. The consensus is that the tumors discovered late in life arose before cessation of ovarian activity. The youngest patient in this group was 7, and the oldest, 72 years of age. Approximately 85 per cent of these tumors were removed from patients between the ages of 16 and 55 years. The incidence was therefore greatest during the reproductive life of the patient.

There was no apparent relationship between the average size of the cysts and the ages of the patients (Tables III and IV).

Gross Appearance.—On gross inspection these cystic masses were smooth and glistening, but, after removal from the body and exposure to the air, the surfaces became wrinkled, stiff, and dull. The shape usually was globular but sometimes was ovoid. The color was, generally speaking, milky white, although the yellow color of the contents was often noted through the wall. Discoloration by blood pigment was found only after torsion of the pedicle. The tumor was soft and cystic at body temperature unless the wall was calcified or contained bone, car-

TABLE III. AVERAGE SIZE OF DERMOID CYST AS RELATED TO AGE OF PATIENT

AGE (YEARS)	SIZE (CM.)
6-10	9.0
11-15	6.0
16-20	12.5
21-25	9.6
26-30	7.1
31-35	8.0
36-40	7.8
41-45	7.4
46-50	9.4
51-55	7.6
56-60	8.8
61-65	16.0
66-70	8.0
71-75	4.5

TABLE IV. INCIDENCE AS TO AGE OF PATIENT AND SIZE OF TUMOR

SIZE OF TUMOR (CM.)	AGE OF PATIENT (YEARS)														
	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80
1					1	1	1	2	1					1	
2					1	2		2	3					2	
3			1		3	4	2	3	1	2	1				
4					1	2	3	4	1	4	1				1
5	1			2	4	1	2	5		1	1				1
6		1			4	5	5		2	2	1	1	1		
7	1				8	4	4	1	1	3	1			1	
8			2	4	4	2	6	6	3	3	1	1	1		
9				1	3	6	6	4	2	3	4			1	
10				1		4	3	3	4						
11				1		1		2	1		1				
12					1		3	1	4	2					
13				2	1		1	2	1	1	1				
14				1						2	1			1	
15	1		1	2		1	2	3				1	1	1	
16			1	1		1					1			1	
17									1			1			
20						1									
23												1			
24									1						
25			1						1			1			
27						1						1			
30					1										

tilage, or teeth. (Although surmised previously, it was not until 1859 that a necropsy, performed while the body was still warm, proved that the fatty contents of a dermoid cyst existed in fluid state during life.) As the contents cooled to room temperature, they became a doughy, semisolid mass. The oily material was composed of fat, desquamated epithelium, glycerides of fatty acids, cholesterol, and other alcohols, a mixture of materials which becomes liquid at temperatures above 34° C. but solidifies at temperatures below 25° C. In this yellow, oily substance were tangled masses of hair and frequently teeth and bone. From the inner surface of the wall, there usually projected a white, shiny protuberance to which numerous hairs were attached. The remainder of the wall was sometimes smooth as in a simple cyst and sometimes granular as in an old abscess cavity. The cyst was usually unilocular, although 12 per cent of this group were multilocular. Multiple dermoids were not present.

The rounded mass projecting from the wall into the cyst cavity, variously known as the dermoid plug, Rokitansky's protuberance, focus, dermoid process, mamilla, or pseudomamma, was found in variable relation to the pedicle of the dermoid. In some cysts it existed as only a thickened portion of the wall, in others as a prominent protuberance varying in size and irregularity and in several it was present as a bridge across the cyst cavity. Occasionally more than one dermoid process was present and in one of this series, four were noted within one unilocular dermoid cavity.

The protuberance was frequently covered with hair and contained bone, cartilage, and teeth. The hair was not always of the same color as that on the head of the patient. Sometimes it was long and coarse and sometimes short and fine as lanugo. The longest hair in this series was 27 cm. While examining the tumors, hairs would be found which at first appeared to be more than 50 cm., but on careful handling it was found that these were only several shorter hairs matted together by the oily contents of the cyst. Much of the hair was broken, lying free within the cyst. The color was brown, black, blond, gray, red, or snow-white, and it was not uncommon to find more than one color in the same dermoid. In bilateral cysts, the color of the hair was frequently different in the two cysts. The color of the hair bore no relation to the age of the patient. In several of the specimens studied, hair was not evident grossly, but on microscopic examination, all but one demonstrated hair follicles in the cyst wall.

Teeth occurred with a frequency exceeding that which one would expect from reading current reports. In this series, teeth were present in 31 per cent of the cases. In four of these, the teeth were not erupted and were not discovered until the tumor was dissected. They resembled adult incisors or molars, rarely canines, but their development was not related to the age of the patient. The roots were single in all but two and these were bifurcated. The enamel and dentine were distinctly formed. Heschl¹¹ found carious teeth in a necrotic tumor, but no caries was evident in any of the teeth examined in this group. The teeth were usually embedded in the wall or occasionally implanted in a rudimentary maxilla or mandible but in three instances they were found free in the cyst cavity.

Phalanges of a finger, rudimentary parts of both extremities, ribs, sternum, pelvis, and even an incomplete skeleton have been reported, but these were not identified in any of the neoplasms dissected.

Repeated examination of patients, who at first had refused surgical treatment or postponed the operation for months or even as long as eight years, indicated that the tumors were of slow growth. They seldom attained a size greater than 16 cm. (Table V), the largest in this series being 30 cm. and the smallest 8 mm. in diameter. The average size is 8.2 cm.; the bilateral tumors average 7.75 cm. in diameter. There is little difference in size as to location, those arising from the right ovary averaging 8.4 cm., those from the left averaging 8.0 cm. in diameter.

Microscopic Findings.—Microscopic examination showed the structure of the dermoid cyst to be more varied than suggested by the appearance on gross examination (Table VI). The cyst wall was thicker than that of other ovarian

TABLE V. INCIDENCE AS TO SIZE OF TUMOR

SIZE (CM.)	TUMORS
1	7
2	10
3	17
4	17
5	19
6	22
7	24
8	33
9	30
10	15
11	6
12	11
13	9
14	5
15	12
16	5
17	2
20	1
23	1
24	1
25	3
27	2
30	1

TABLE VI. INCIDENCE OF STRUCTURES OBSERVED MICROSCOPICALLY

STRUCTURE	PER CENT
Stratified squamous epithelium	100
Sebaceous glands	97
Hair follicles	99
Apocrine glands	47
Sweat glands	64
Brain	37
Nerve	47
Ganglion cells	19
Ependymal cells	25
Teeth	31
Cartilage	27
Bone	41
Smooth muscle	74
Fat	75
Lymphocytes	51
Foam cells (pseudoxanthoma)	55
Giant cells	61
Thyroid	13
Gastrointestinal tract epithelium	12
Respiratory tract epithelium	53
Salivary glands	16
Ovarian tissue	91
Adult lung	2
Fetal lung	1
Brenner tumor	1
Oligodendroglial tissue	1
Carcinoid	1
Squamous-cell epithelioma, grade 3	2
Nodes of Ranvier	1
Retina	2
Pancreas (?)	1
Prostate	1

cystomas. Derivatives of ectoderm were evident in 100 per cent of the tumors. The interior was lined by stratified squamous epithelium which resembled skin although there was no tendency to the production of a horny layer. Papillae were small and were often absent. No "touch corpuscles" were identified. There was a tendency for the stratified epithelium to become thinner in the portion of the cyst farthest from the dermoid process (Fig. 1, *a*) and in some instances squamous epithelium was lacking in portions of the cyst (Fig. 1, *b*). These denuded areas were composed of granulation tissue with pseudoxanthoma cells and frequently foreign body giant cells. Localized areas of lymphocytic infiltration appeared beneath the stratified epithelium in 46 per cent (Fig. 1, *c*).

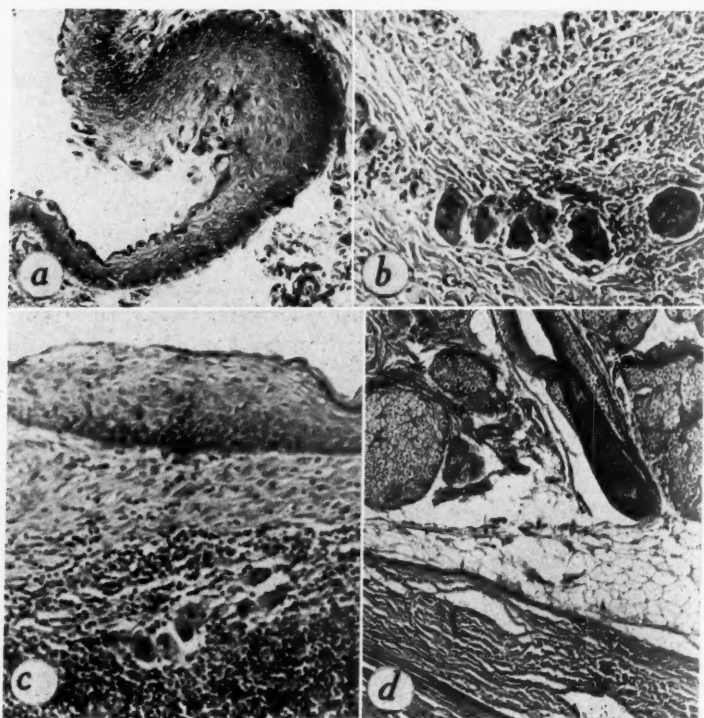


Fig. 1.—Ovarian dermoid cyst showing: *a*, Thinning of stratified squamous epithelium ($\times 100$). *b*, Foreign body type of giant cells. Overlying squamous epithelium has been destroyed. Pseudoxanthoma cells are also seen ($\times 85$). *c*, Localized areas of lymphocytes beneath the lining epithelium ($\times 95$). *d*, Well-developed sebaceous glands and hair follicle ($\times 32$).

Hair follicles were present in 99 per cent (Fig. 1, *d*) and were well formed even in the absence of grossly recognizable hair.

Typical sebaceous glands were found in 97 per cent (Fig. 1, *d*). It was felt that these are chiefly responsible for the presence of the oily, sebaceous contents of the cyst.

Sudoriferous glands were present in 64 per cent of this series (Fig. 2, *a*). Apocrine glands were noted in 47 per cent of the cysts (Fig. 2, *b*). Both types of glands were well formed.

Brain substance was recognized in 37 per cent of the group and constituted one of the most interesting types of tissue in this study. Fig. 2, *c* shows an attempt at convolutions of the cerebellum. Well-developed Purkinje fibers were

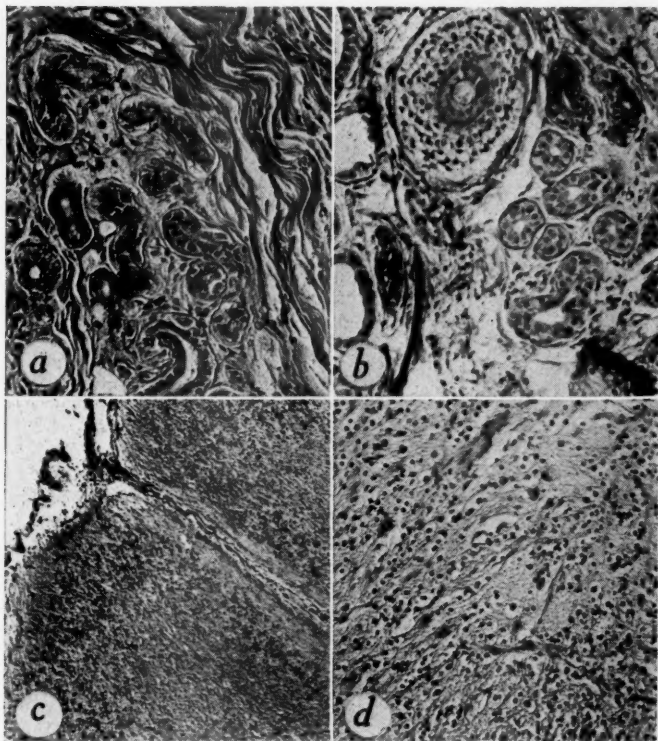


Fig. 2.—Ovarian dermoid cyst showing: *a*, Section through coiled sweat glands ($\times 100$). *b*, Apocrine and sweat glands. Sebaceous gland and cross section of hair follicle also illustrated ($\times 95$). *c*, Convolutions of cerebellum. The three strata are distinct ($\times 42$). *d*, Oligodendroglial tissue simulating an oligodendroglioma ($\times 100$).

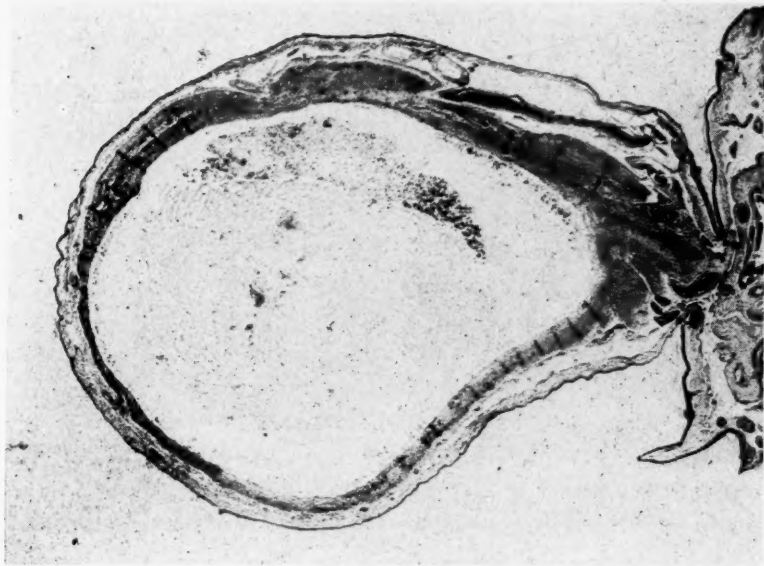


Fig. 3.—Structure simulating the optic vesicle ($\times 9$).

present in two cases. Fig. 2, *d* reveals oligodendroglial cells, which are suggestive of an oligodendroglioma. Calcification of the brain tissue, in the absence of calcium deposits elsewhere in the cyst wall, was present in 7 per cent. Areas resembling retina were found in two cases, one occurring in connection with what apparently was a rudimentary optic vesicle (Fig. 3). Ependymal cells were identified in 25 per cent of the tumors and in two instances areas typical of choroid plexus were seen (Fig. 4, *a*).

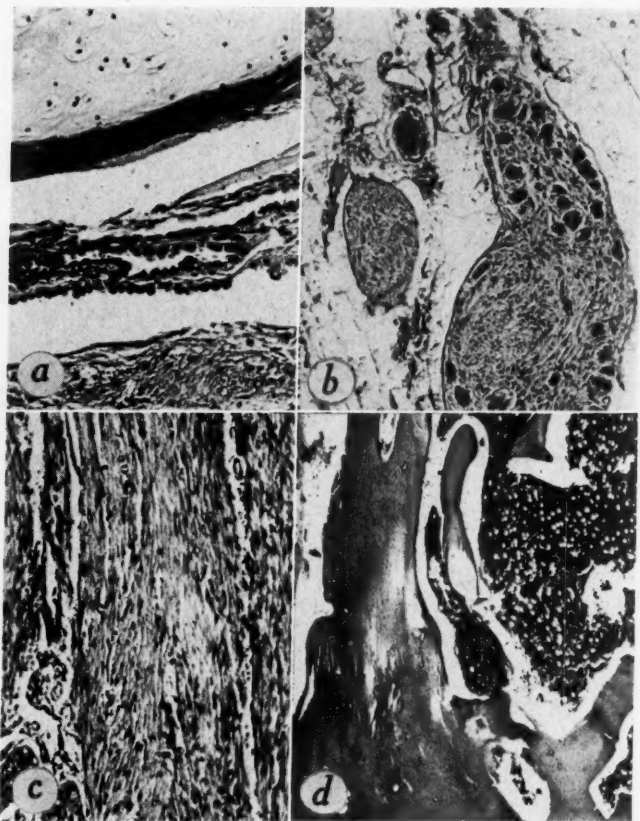


Fig. 4.—Ovarian dermoid cyst illustrating: *a*, An area typical of the choroid plexus ($\times 100$). *b*, Ganglion cells and nerve fibrils ($\times 65$). *c*, Sheets of smooth muscle fibers ($\times 80$). *d*, Marrow-containing bone ($\times 13$).

In forty-seven of these tumors, nerve fibers were identified and these were of the nonmedullated type with but one exception, which clearly exhibited the myelin sheath and nodes of Ranvier. Ganglion cells were present in nineteen of the cyst walls (Fig. 4, *b*).

Mesodermal elements were common, occurring in 93 per cent of this group. Smooth muscle was present in 74 per cent, usually as localized bundles, although sheets of muscle tissue were frequently encountered (Fig. 4, *c*). Striated muscle fibers have been reported but never confirmed. None were identified in our material.

Bone was represented in 41 per cent, and half of these exhibited marrow (Fig. 4, *d*). In three cases the bony structure supported teeth and resembled

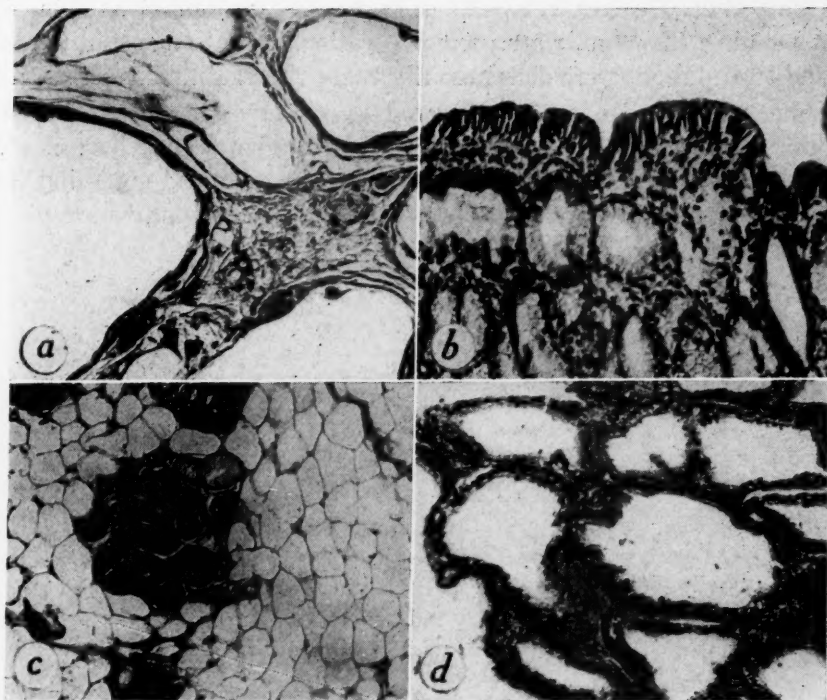


Fig. 5.—Ovarian dermoid cyst illustrating: *a*, Cystlike spaces lined by giant cells ($\times 100$). *b*, Epithelium resembling the gastric mucosa ($\times 120$). *c*, Salivary gland of mixed mucous and serous type ($\times 60$). *d*, Tissue resembling fetal lung ($\times 100$).

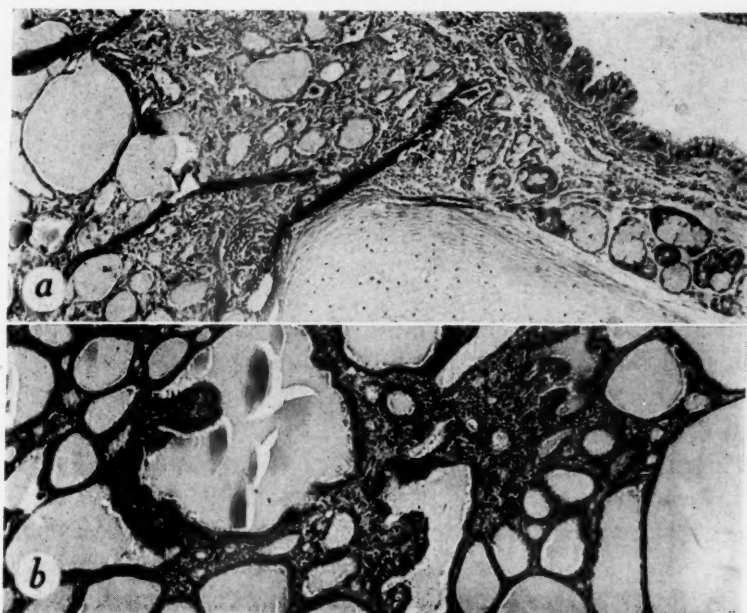


Fig. 6.—Ovarian dermoid cyst illustrating: *a*, Respiratory tract type of epithelium, tracheal glands, cartilage, and thyroid ($\times 55$). *b*, Thyroid tissue with parenchymatous hypertrophy ($\times 60$).

that of the maxilla; in one there was a likeness to the mandible. Thin plates of bone, as found in the skull, were present occasionally but one could not say that any of these formations were definitely like that of the adult skeleton.

Frequently, sievelike areas separated by thin partitions of fibrous tissue were found. These cystlike spaces were lined by giant cells (Fig. 5, *a*). This condition has been thought to represent an undifferentiated epithelial tissue or foreign body giant cells, but in any event it seems to be pathognomonic of dermoid cyst of the ovary.

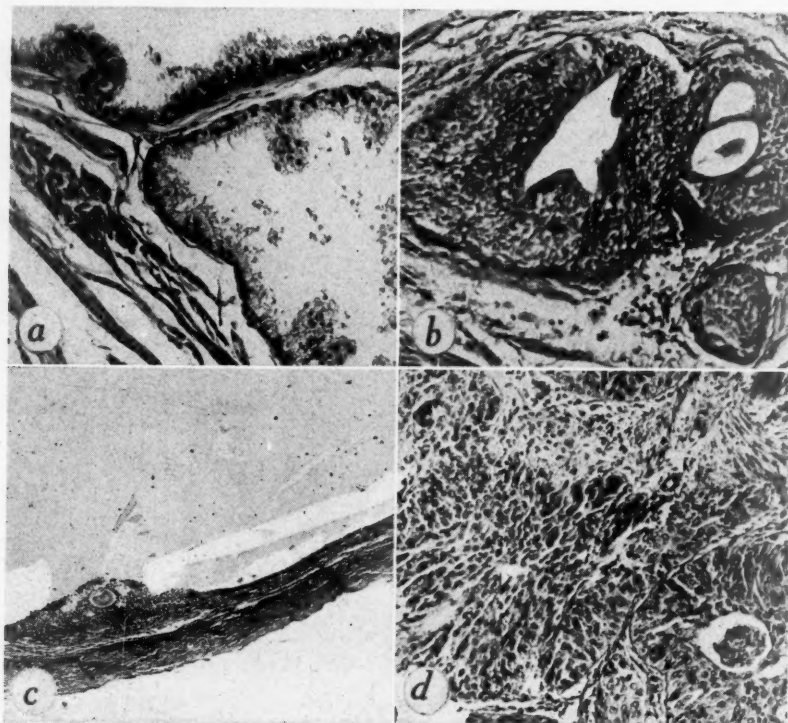


Fig. 7.—Ovarian dermoid cyst illustrating : *a*, Prostatelike tissue ($\times 100$). *b*, Brenner tumorlike structure ($\times 100$). *c*, Graafian follicle with ovum found in the wall of the cyst, which had grossly destroyed the entire ovary ($\times 23$). *d*, Squamous-cell carcinoma, grade 3 ($\times 75$).

Entodermal structures were noted in 71 per cent. Tissue resembling epithelium of the gastrointestinal tract was present in 12 per cent (Fig. 5, *b*). Salivary glandular tissue was seen in 16 per cent (Fig. 5, *c*) and was usually of the mixed mucous and serous type. Fetal lung tissue appeared in one case and adult lung tissue was identified in two instances (Fig. 5, *d*). Bronchial epithelium (Fig. 6, *a*) was present in 53 per cent, and bronchial glands were associated with this in 24 per cent. Cartilage was frequently found nearby and occasionally thyroid tissue was present in this same area. Thyroid tissue has been identified in 13 per cent. In four of these cases there was evidence of parenchymatous hypertrophy (Fig. 6, *b*) but in the two cases in which basal metabolic estimations had been made, the rate was within normal limits.

In one tumor, tissue resembling the prostate was found (Fig. 7, *a*).

In one section, tissue resembling the epithelium of the Brenner type of tumor was present. This was the only area of this nature in the cyst wall and the only case known in which cells of this type have been identified in a dermoid cyst of the ovary (Fig. 7, b).

An area of tissue resembling pancreas was seen in one section.

Islands of fatty tissue were found in 75 per cent of the tumors.

Evidence of irritation or infection was observed in more than half of the dermoid cysts. Lymphocytes were found in 51 per cent of the tumors. In 55 per cent, pseudoxanthoma cells were evident. In 61 per cent of the neoplasms, giant cells of the foreign body type were present, usually just beneath the stratified squamous epithelium (Fig. 1, b) or in the granulation tissue lining denuded areas.

The outer portions of the cyst walls were composed mainly of fibrous tissue, which, however, contained identifiable remnants of ovarian cortical tissue in 91 per cent. Unruptured follicles (Fig. 7, c) and corpora lutea were present in the great majority of cases, although the pathologist or surgeon frequently reported that the ovary had been completely destroyed. It should be remembered that in the literature pregnancy had occurred in connection with bilateral ovarian dermoids in more than fifty cases.¹

Clinical Characteristics.—To determine whether or not dermoid cysts of the ovary produce symptoms of diagnostic significance, Table VII was prepared to show the incidence and duration of the primary complaint. Pain was the most common complaint which brought the patient to seek medical advice. This pain varied from a dull ache to the sharp pain produced by torsion of the pedicle. The pain was referred to the side from which the tumor arose in all but two cases, and the duration varied from a few hours to twenty years. Five patients were admitted for "gallbladder colic" and were operated on primarily because of cholecystitis with or without cholelithiasis. One patient had a "ruptured" appendix, and two were suffering from pain of acute duodenal ulcers. One patient was found to have a concomitant tubal pregnancy.

Only thirty-four patients had noted any increase in the size of the abdomen, although the size of the tumor was as great in many patients who had not been aware of the presence of any abdominal swelling as in those who had noticed an increase.

One might expect multiple abnormalities of the menstrual flow but, as is shown in Table VIII, the menses were seldom affected and in almost all cases in which the menses were affected there were other pathologic lesions which would better explain the abnormal bleeding from the uterus. The age of onset of menstruation of fifty-four patients whose history contained this information is shown in Table IX. Table X shows the age of cessation of menstruation in forty-seven cases. It appears that altered physiology of menstruation is not a characteristic symptom of dermoid cysts of the ovary.

It has been stated that single and nulliparous adults are more susceptible to dermoid growths than women who have borne children. In this series, this is not true. Twenty per cent of this group were single. Of the 180 married women, only 11.7 per cent had not borne children at the time of operation. Of

these, one was married at the age of 45 years and another later became pregnant, which actually corrects the sterility percentage to 10.6. This is not in excess of the accepted incidence of sterility of married couples in the United States. The association of pregnancy with bilateral ovarian dermoids has been mentioned in the foregoing.

TABLE VIII. INCIDENCE OF MENSTRUAL HISTORY

MENSTRUAL HISTORY	CASES	PER CENT
Normal and regular	183	81.3
Normal but irregular	6	2.7
Menorrhagia (uterine fibroids present)	23	10.2
Menorrhagia (no associated lesion)	2	0.9
Metrorrhagia (uterine fibroids present)	4	1.8
Postmenopausal bleeding (carcinoma of fundus)	4	1.8
Inadequate menstrual history	3	1.3

TABLE IX. AGE OF ONSET OF MENSTRUAL PERIODS

AGE (YEARS)	CASES
11	5
12	16
13	16
14	10
15	4
16	2
17	1

Average age of onset = 13 years.

TABLE X. AGE OF CESSATION OF MENSES

AGE (YEARS)	CASES
38	1
40	1
41	2
43	2
44	1
45	5
46	3
47	1
48	4
49	2
50	13
51	3
52	2
53	3
54	1
55	2
56	1

Average age = 48.4 years.

A "sense of pressure" was the symptom responsible for 24 patients applying for medical aid. Of these, 10 had noted frequency of urination and 13 had felt a dragging sensation in the pelvis for from two months to ten years.

Abnormal vaginal discharge was complained of by three of the women, and in two of these, *Trichomonas vaginalis* was present and responded to local therapy. The third was found to have a draining tract direct from the dermoid into the vagina.

Six of the patients were registered because of a lump in their breasts which had been noted for from one week to one year. Seven complained of increasing exhaustion and five came to the clinic because of an enlarged thyroid gland.

Five patients complained of diarrhea of from six months' to five years' duration. Of these, three had carcinoma of the rectum or sigmoid.

Dermoid cysts were found in the ovaries of 57 women during the course of a routine general physical examination. These patients were in good health with no symptoms. They had applied for examination because of routine reasons involving insurance and so forth.

Table XI demonstrates that the size of the tumor was not necessarily related to the symptoms produced. As would be expected, those tumors producing abdominal enlargement and pressure were large, but equally large tumors did not necessarily produce symptoms in other cases. In two cases, delivery was complicated by dermoids measuring 8 cm. and 9 cm. in diameter, and in both cases mechanical difficulty was encountered. One patient required manual displacement of the tumor to allow the head to engage. The other required cesarean section.

TABLE XII. INCIDENCE OF COMPLICATIONS

COMPLICATIONS	CASES	PER CENT
<i>Preoperative</i>		
Twisted pedicle	17	7.6
Ruptured cyst	1	0.4
Parasitic cyst	2	0.9
Adhesions	12	5.3
Infected cyst	1	0.4
Vaginal fistula	1	0.4
<i>Operative</i>		
Cyst ruptured during removal	8	3.6
<i>Postoperative</i>		
Parotitis	1	0.4
Thrombophlebitis	1	0.4
Death	4	1.8
Peritonitis	1	0.4
Pulmonary embolism	2	0.9
Decerebrate rigidity (36 hr. postop.)	1	0.4

The complications met with in this series of dermoids are listed in Table XII. Preoperative complications existed in 15 per cent. In seventeen cases the pedicle of the cyst had become twisted. In these, pain, the predominating symptom, was sharp and agonizing and was referred to the side from which the tumor originated. One cyst had ruptured eight days before the patient's admission, but the patient recovered after a stormy convalescence. One cyst had ruptured into the vagina, through which it drained, but this patient died of generalized peritonitis.

Two of the dermoids had become detached from the ovary. One had attached itself to the parietal peritoneum of the abdominal wall and the other had become attached to the uterosacral ligaments.

Only one cyst was acutely infected, although it is generally agreed that these cysts are especially liable to such a complication.

The cyst was densely adherent in twelve cases, and in eight of these it ruptured during surgical removal. In none of these cases, however, did symptoms of peritonitis develop.

Six of the patients were registered because of a lump in their breasts which had been noted for from one week to one year. Seven complained of increasing exhaustion and five came to the clinic because of an enlarged thyroid gland.

Five patients complained of diarrhea of from six months' to five years' duration. Of these, three had carcinoma of the rectum or sigmoid.

Dermoid cysts were found in the ovaries of 57 women during the course of a routine general physical examination. These patients were in good health with no symptoms. They had applied for examination because of routine reasons involving insurance and so forth.

Table XI demonstrates that the size of the tumor was not necessarily related to the symptoms produced. As would be expected, those tumors producing abdominal enlargement and pressure were large, but equally large tumors did not necessarily produce symptoms in other cases. In two cases, delivery was complicated by dermoids measuring 8 cm. and 9 cm. in diameter, and in both cases mechanical difficulty was encountered. One patient required manual displacement of the tumor to allow the head to engage. The other required cesarean section.

TABLE XII. INCIDENCE OF COMPLICATIONS

	COMPLICATIONS	CASES	PER CENT
<i>Preoperative</i>			
	Twisted pedicle	17	7.6
	Ruptured cyst	1	0.4
	Parasitic cyst	2	0.9
	Adhesions	12	5.3
	Infected cyst	1	0.4
	Vaginal fistula	1	0.4
<i>Operative</i>			
	Cyst ruptured during removal	8	3.6
<i>Postoperative</i>			
	Parotitis	1	0.4
	Thrombophlebitis	1	0.4
	Death	4	1.8
	Peritonitis	1	0.4
	Pulmonary embolism	2	0.9
	Decerebrate rigidity (36 hr. postop.)	1	0.4

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Two of the dermoids had become detached from the ovary. One had attached itself to the parietal peritoneum of the abdominal wall and the other had become attached to the uterosacral ligaments.

Only one cyst was acutely infected, although it is generally agreed that these cysts are especially liable to such a complication.

The cyst was densely adherent in twelve cases, and in eight of these it ruptured during surgical removal. In none of these cases, however, did symptoms of peritonitis develop.

The mortality rate for the entire series was 1.8 per cent. Two women expired from pulmonary emboli and one died thirty-six hours postoperatively with decerebrate rigidity. In one case right parotitis and in another thrombophlebitis developed but both patients recovered satisfactorily.

Malignant transformation, an infrequent complication of dermoid cysts of the ovary (Figs. 7, *d* and 8), was present in three cases. In two of these the type was squamous-cell epithelioma, and in the third the neoplasm was an argentaffin carcinoma (carcinoid).

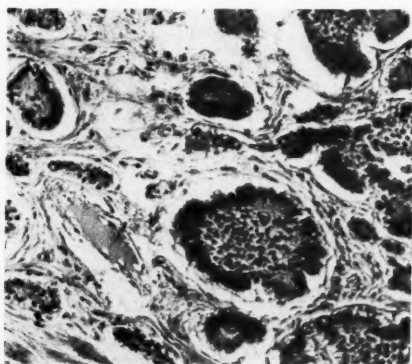


Fig. 8.—Grade 1 adenocarcinoma (carcinoid tumor) in wall of an ovarian dermoid cyst ($\times 100$).

In this series of tumors, the most frequent indication for surgical intervention was the tumor mass of the dermoid cyst. Next in frequency was the presence of uterine fibroids (Table XIII). This does not imply that the preoperative diagnosis was correct in these cases but merely the nature of the mass for which operation was recommended. The most frequent preoperative diagnosis (Table XIV) was ovarian cyst, but in 24 instances the correct diagnosis of ovarian dermoid was made. Of these 24, 12 were discovered or confirmed by the roentgenologist while examining roentgenograms of the kidney, bowel, or pelvis. The greatest single factor in roentgenologic diagnosis of dermoid cysts is the presence of teeth, since areas of calcification also occur in cases of calcified fibroids, ureteral and vesical calculi, phleboliths, and healed tuberculosis with calcification. Robins and White²⁴ have reported an additional aid to diagnosis in the absence of formed calcified shadows. They called attention to a rounded or ovoid mass, of decreased density due to the nature of the contents, and encircled by a well-defined ring of increased density produced by the capsule of the cyst. The area of decreased density is banded or mottled, an appearance which is explained by the hair mixed with sebaceous material. The recognition of these signs should increase appreciably the percentage of correct preoperative diagnoses.

As is evident in Table XV, there is a high incidence of associated lesions. Uterine fibroids are present in approximately a third of the cases. The significance of this association is not yet apparent.

Comment

From the microscopic findings in this series of 100 dermoid cysts of the ovary, ectodermal derivatives were found to be present in 100 per cent of the

TABLE XIII. INDICATIONS FOR SURGICAL INTERVENTION

INDICATION	CASES
Dermoid cyst	162
Pseudomucinous cyst	8
Simple cyst	3
Serous cyst adenoma	3
Tarry cyst	2
Parovarian cyst	1
Endometriosis	1
Ruptured appendix	1
Uterine fibroids	20
Cholecystitis	7
Carcinoma of fundus of uterus	6
Carcinoma of rectosigmoid	3
Carcinoma of ovary	2
Pelvic inflammatory disease	4
Tubo-ovarian abscess	1
Ectopic pregnancy	1

TABLE XIV. PREOPERATIVE DIAGNOSIS OF PELVIC MASS

DIAGNOSIS	CASES
Ovarian cyst	86
Uterine fibroids	32
Ovarian dermoid	24
Ovarian mass	17
Cyst anterior to uterus	4
Cyst posterior to uterus	10
Adnexal tumor	5
Pelvic mass	19
Pelvoabdominal tumor	10

TABLE XV. INCIDENCE OF ASSOCIATED LESIONS

LESION	CASES
Uterine fibroids	70
Chronic appendicitis	39
Acute appendicitis	1
Cyst of Morgagni	23
Pseudomucinous cystadenoma	11
Serous cystadenoma	4
Simple ovarian cyst	11
Tarry cyst	4
Fibroma of ovary	2
Adenocarcinoma of ovary	4
Adenocarcinoma of uterus	6
Fibrosarcoma of uterus	1
Carcinoma of rectosigmoid	5
Cholecystitis	10
Hydrosalpinx	8
Pelvic inflammatory disease	6
Duodenal ulcer	2
Endometriosis	3
Tuberculous perisalpingitis	2
Adenomyoma	1
Ectopic pregnancy	1
Bicornate uterus	1
Unicornate uterus	1

tumors, mesodermal derivatives in 93 per cent, and entodermal derivatives in 71 per cent.

The percentage of both mesodermal and entodermal structures present was greater than those reported by other investigators. This is no doubt due to the fact that multiple sections (ten to fifteen) were taken from each dermoid cyst rather than the one or two usually studied. Also, sections were always taken through the dermoid process even if it contained bone. Derivatives of all three germ layers are more likely to be found in this protuberance than elsewhere in the cyst. It is very probable that if serial sections were taken of each tumor, the incidence of mesodermal and entodermal structures might more nearly approach 100 per cent.

The term "dermoid cyst," which describes only one portion of the cyst, does not fully define nor describe the growth. The same name is applied, and correctly so, to the sequestration dermoids of the skin and other parts of the body, which contained structures derived only from the ectoderm. Since all embryonic layers may be represented, these cysts of the ovary should be regarded as teratomas and should be designated as cystic teratomas to distinguish them from the solid teratomas of the ovary.

None of the suggested hypotheses appear to explain adequately the histogenesis of these tumors, but, regardless of their intimate cause, it is probable that the tumor tissue was formed long before it was discovered. These cysts are lined with skinlike epithelium containing sebaceous glands, which no doubt form the contents of the cyst. The activity of the sebaceous glands is greatly augmented at puberty. The finding of these tumors during the reproductive life of the individual may well result from the active secretion from the glands lining the wall of the cyst. The increased incidence after puberty may be due to the more rapid distention of the cyst cavity as a result of stimulation of the sebaceous glands at this period of the patient's life.

These tumors occurred in all decades of life but they are most commonly found during the period of sexual activity. The oldest patient in our series was 72 years of age and she was of the opinion that the cyst had bothered her for more than twenty years. The size of the cysts apparently was not related to the age of the patient. The rate of growth was slow. It is not unlikely that many women live a normal lifetime with undiscovered teratomas.

It has been claimed that these cysts have a predilection for one side or the other, but in this series they occurred almost equally on either side.

It has been stated, "Dermoids are rarely lined with skin. This structure is confined to the embryonal rudiment or to its immediate neighborhood." This we found to be untrue. In fact, it was common to encounter stratified squamous epithelium, sebaceous glands, and hair follicles in all portions of the cyst walls, even in that portion farthest from the focus.

It has been the opinion of some that single and nulliparous adults are more susceptible to these cystic tumors than women who have borne children, but in this study only 20 per cent of the patients were unmarried. Of the married patients, only 11.7 per cent had not borne children at the time of operation. Of these, one had not married until the age of 45 years and one has since been de-

livered of a full-term child. This corrects the infertility rate to 10.6 per cent. It is generally accepted that 10 per cent of the marriages in the United States are barren. Reproductive function is therefore affected slightly, if at all, by the presence of these tumors.

There were no characteristic symptoms of cystic teratomas. Menstrual disturbances when present were usually the result of associated pathologic lesions. The larger the neoplasm, the more likelihood there was of the presence of clinical manifestations, as in any ovarian tumor.

When complications occurred, such as torsion of the pedicle or rupture of the cyst, the diagnosis of "a surgical lesion" became apparent but the exact type of the "ovarian pathology" was not diagnosed with any degree of certainty preoperatively. The contents of the cyst have been considered very irritating to the peritoneum. Yet, one cyst ruptured preoperatively and eight ruptured during surgical removal without producing any symptoms of peritonitis. This is probably explained by the fact the ruptured contents were washed from the abdominal cavity with physiologic saline solution at the time of operation. One dermoid ruptured into the vagina and produced fatal peritonitis. Peritoneal "implants" may take the form of numerous cellular nodules associated with a foreign body giant-cell reaction, but, in this group of cases, only one cyst had ruptured into the peritoneal cavity preoperatively and no implants were evident.

In two cases the cyst interfered with the progress of labor. Large myomas of the uterus are more adaptable than ovarian cysts to the enlarging fetus, and the experience gained from management of a pregnancy in a myomatous uterus is not applicable to the complicating presence of ovarian tumors. Ovarian cysts are more prone to produce dystocia or to rupture during delivery and produce fatal peritonitis. If the tumor is large and in position to obstruct pelvic delivery, it is imperative that surgical intervention be considered during the pregnancy.

The only satisfactory treatment of cystic teratomas of the ovary is surgical removal. Inasmuch as this study revealed that 91 per cent are associated with ovarian tissue, it is especially recommended that when possible the neoplasm should be resected from the normal ovarian tissue. This is especially desirable if the tumor is bilateral. The practice of tapping an ovarian cyst fortunately has been discarded. In reading the reports in the literature of a century or more ago, one is impressed by the number of deaths following the tapping of ovarian cysts "containing hair and oily material." That malignant lesions do occur, even though in a small percentage of cases, is an additional reason for early surgical removal. It also is a good argument for the routine microscopic examination of all tumors even though they appear grossly to be benign.

Conclusions

Study of the data obtained from the records of 225 patients who had cystic teratomas removed surgically at the Mayo Clinic and from the microscopic examination of 100 consecutive tumors permits of drawing the following conclusions:

Ectodermal derivatives were present in 100 per cent of the tumors, mesodermal structures in 93 per cent, and entodermal derivatives in 71 per cent of these cysts.

The high percentage of mesodermal and entodermal elements was due to the fact that multiple sections have been examined microscopically. Serial sections would probably have revealed more.

The term "dermoid" is inaccurate and should be replaced by the term "cystic teratoma."

The hypotheses that have been advanced to explain the histogenesis of these neoplasms do not explain their origin adequately.

These tumors occurred with equal frequency in either ovary.

Twelve and four-tenths per cent were bilateral.

The average diameter was 8.2 cm.

The incidence of cystic teratomas was 5 per cent of all ovarian neoplasms.

Malignant lesions occurred in 3 per cent of cystic teratomas.

Symptoms associated with these cysts had no differential diagnostic value.

Surgical removal was the treatment of choice, but, when possible, resection of the tumor was done to conserve ovarian function.

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THE OBSTETRICIAN'S RESPONSIBILITY FOR THE HAZARDS OF THE FIRST FEW DAYS OF LIFE WITH SPECIAL REFERENCE TO ANOXIA AND PREMATUREITY*

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THE obstetrician's responsibility with regard to the hazards of the first few days of life are many and varied. Consideration of all of the factors which might lead to a reduction of these hazards would include almost the entire field of obstetrics and would lead to much controversy. Instead of attempting to cover such a wide field, I have reviewed the last five years' records of the deliveries of all infants who reached the period of viability, with the view to ascertaining for this presentation how we might lower our infant mortality at the Long Island College Hospital.

Maternal and Infant Mortality

In the five-year period from 1940 through 1944, 7,580 infants weighing 1,000 grams or over were born at the Long Island College Hospital. Twelve, or 1 in 631, of the mothers died. (There were three additional maternal deaths which are not included in these statistics because they occurred in the middle of pregnancy long before the stage of viability had been reached.) During this period, 99, or 1.3 per cent, of the infants were born dead and 101, or 1.33 per cent, died while in the hospital. The total number of stillbirths and neonatal deaths accordingly was 200, a combined fetal and neonatal mortality of 2.63 per cent. The statistics for each of these five years are shown in Table I.

TABLE I. MATERNAL AND FETAL MORTALITY
PREMATURE (1,000 TO 2,500 GRAMS) AND FULL-TERM DELIVERIES
(LONG ISLAND COLLEGE HOSPITAL)

	DELIVERIES OVER 1,000 GRAMS	MATERNAL DEATHS	STILL- BIRTHS	NEONATAL DEATHS	FETAL AND INFANT DEATHS	FETAL AND NEONATAL MORTALITY (%)
1940	1381	2	19	19	38	2.75
1941	1537	1	21	17	38	2.47
1942	1651	3	18	23	41	2.48
1943	1583	4	23	23	46	2.90
1944	1428	2	18	19	37	2.51
	7580	12*	99	101	200	2.63
		or (1 in 631)	or 1.3%	or 1.33%		

This combined infant mortality of 2.63 per cent is lower than that which is reported from some institutions. Four important factors may be responsible for our better results. One of these is the physical setup of our nurseries, which made possible the use of the unit

*Read at a meeting of the Brooklyn Gynecological Society, April 6, 1945.

system in caring for newborn infants. This, together with a separate formula room in which an aseptic technique similar to that followed in the surgical operating room is employed, has greatly reduced the incidence of infection. The second factor is the excellent cooperation which we receive from the pediatric department. While the attending obstetrician nominally is responsible for the child which he delivers, its care is turned over to the department of pediatrics as soon as it leaves the delivery room. The third factor is the fact that we discuss all stillbirths and neonatal deaths at our monthly staff meetings, and the pediatric resident participates in this discussion. The fourth factor is our reluctance to push sedation beyond the point at which it is safe for the child. A number of years ago, when we were using morphine and scopolamine according to the so-called "twilight sleep" technique, we learned that sedative drugs given to the mother might cause the loss of the child. While we knew nothing about anoxia in those days, our experience made us cautious. As a result, we do not promise our patients an absolutely painless labor, but we aim to relieve as much pain as is possible within the limits of safety for the child.

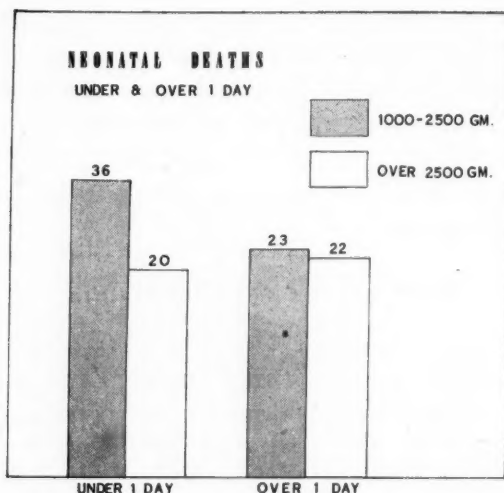


Fig. 1.

Causes of Neonatal Deaths

The effect of detrimental prenatal influences and serious intrapartum injuries is clearly demonstrated by the fact that 36 of the 59 premature and 20 of the 42 full-term neonatal deaths occurred within twenty-four hours after birth (Fig. 1). The responsibility for nearly 60 per cent of the neonatal deaths, therefore, rests almost entirely upon the obstetrician. In addition, the obstetrician must accept a fairly large share of the responsibility for the neonatal deaths which occur after the first day, if our experience may be taken as a criterion. That this is so is evident from a grouping of the 101 neonatal deaths according to their causes. Congenital anomalies were responsible for 32.6 per cent of all deaths. Nine and nine-tenths per cent were due to infection. Brain hemorrhage was demonstrated in 14.8 per cent, while the remainder, or 41.5 per cent, showed nothing more than congenital atelectasis when autopsy was permitted (Fig. 2). In the latter group, however, respiratory symptoms were almost invariably present, and most of the deaths in this classification were preceded by periods of intermittent cyanosis. Because this is the largest of the four groups, and because 50 per cent or more of the infants in each group weighed between 1,000 and 2,500 grams, any future improvement which may be obtained in our service must come largely from a lessening of the hazards which accompany premature deliveries, or from a reduction of this large group of cases which are included under the heading of intermittent cyanosis.

Effect of Anoxia

Because the large group which has been included under the heading of intermittent cyanosis showed the same respiratory symptoms which are present when tentorial tears and

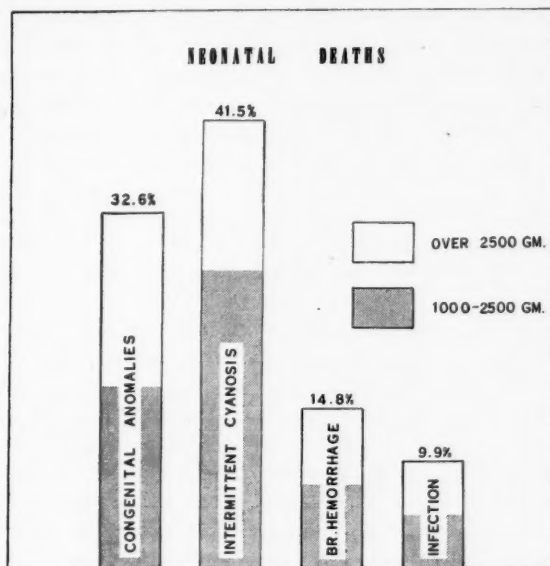


Fig. 2.

OXYGEN SATURATION OF THE BLOOD GOING TO AND COMING FROM THE PREGNANT UTERUS

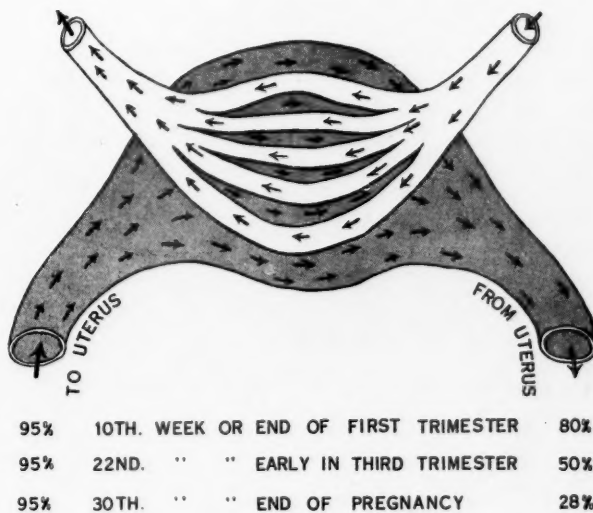


Fig. 3.

injuries of the brain are demonstrable at autopsy, it is our impression that most of the cases in this large group included under the heading of intermittent cyanosis have congenital atelectasis and show respiratory symptoms, because the brain likewise has been injured. Although

the lesion cannot be demonstrated by our present methods, it quite probably is produced by the effect of anoxia on the cells of this vital structure. If this hypothesis is correct, a review of some of the causes of anoxia may be of service. We all are familiar with the effect of prolapse of the cord, of knots in the cord and of coils of cord about the neck and extremities. We also know that the cord may be compressed and the circulation cut off when the uterus becomes molded about the child in a long dry labor. Because such complications and their treatment are familiar to all obstetricians, their discussion will be omitted. Other and more common causes of anoxia may not be so familiar to the average obstetrician. To understand them, one must study the mechanism by which oxygen and carbon dioxide are exchanged between the fetal and maternal circulations at the placental site. A crude diagram of the fetal and maternal circulations is shown in Fig. 3. The unshaded portion of this diagram represents the fetal circulation. Fetal blood enters the placenta from the umbilical arteries, then passes through the capillary systems of the chorionic villi and is returned to the fetus by way of the umbilical vein. The shaded portion represents the maternal circulation. Maternal blood from the uterine and ovarian arteries passes through an arteriovenous fistula, the placental lake, to the maternal venous circulation. If the circulation in the human is similar to that of the rabbit, the fetal blood flows in a direction opposite to that of the maternal blood stream.¹ In the rabbit at the tenth week, or the stage corresponding to the end of the first trimester in the human being, the arterial blood which enters the placental site through the maternal circulation is 95 per cent saturated with oxygen. When it leaves the uterus at this time, it is 80 per cent saturated. As gestation advances, and the fetus requires more oxygen, the saturation of the blood which comes from the placental site is diminished until, at the thirtieth week or the end of pregnancy, the blood which comes from the pregnant uterus is only 28 per cent saturated.² This experiment shows that the transmission of oxygen by the maternal blood through the placental site does not increase in proportion to the increasing demands of the developing fetus. If it could have been prolonged, and if the oxygen saturation of the blood which comes from the uterus continued to diminish at a similar rate, one might conclude that within a short time after term the oxygen supply would have been inadequate for the survival of the fetus. The relative inadequacy of the placental lake as a source of oxygen when compared with the lungs after birth is also shown by the fact that the red blood count, the hemoglobin, and the volume of the red blood cells are greater at birth than they are several weeks later. The apparent inability of the maternal blood to furnish an adequate supply of oxygen is thus compensated for, to some extent, by an increase in the fetal blood's ability to absorb oxygen, the oxygen capacity of fetal blood being 20.8 volume per cent as compared with an oxygen capacity of 15.4 volume per cent for maternal blood.³ These blood findings at birth have led to the suggestion that the fetus is subjected to the same difficulty in securing an adequate supply of oxygen as is experienced by an adult man who lives in the rarified atmosphere of a very high mountain.

If the oxygen saturation of the maternal blood which flows through the placental lake normally is so inadequate that the fetus must make compensatory adjustments in its own blood to secure an adequate supply of this essential element, it must be evident that anything which might reduce the oxygen content of the maternal blood, or which might retard the circulation of that blood through the placental lake might very well lead to anoxia in the fetus.

A large maternal hemorrhage might so reduce the oxygen carriers in the mother's blood as to cause asphyxiation of the fetus in utero. This explains the sudden death of the fetus which often follows the removal of a large amount of blood when a massive phlebotomy is done for eclampsia. It also explains the frequent death of the fetus in those cases of placenta previa which are accompanied by profuse hemorrhage. In the interest of the child, accordingly, phlebotomy is contraindicated in eclampsia, and such cases of placenta previa should, if possible, receive a blood transfusion before pregnancy is interrupted and the fetus is subjected to a further diminution of its oxygen supply. The use of oxygen and transfusion immediately after birth also may prove of benefit to the child.

A knowledge of the difficulties under which the fetus obtains its oxygen also shows why the fetus so frequently dies in utero when the mother is suffering from the marked dyspnea

which accompanies pneumonia and cardiac failure. It also leads to the suggestion that some of these fetuses might be saved by more frequent use of oxygen in the treatment of pneumonia as well as in the treatment of decompensation in cardiac disease. For the same reason, termination of the labor in these cases by low forceps and episiotomy under local anesthesia, may be a lifesaving measure from the fetal as well as the maternal standpoint.

When the mother's respirations are slowed and made more shallow by the use of sedative drugs and anesthetics, the oxygen supply to the placental lake is diminished, and the danger of intrauterine anoxia and asphyxiation are increased to such an extent that most of the methods which have been recommended for the relief of pain during labor may cause the death of the child if they are not given with caution. These drugs also pass through the placenta and depress the respiratory center of the fetus, with the result that respiration after birth often is impaired and further anoxia is thus produced. While artificial respiration may sustain life until the respiratory center has recovered from the action of these drugs and the child is able to breathe naturally, the effect of the anoxia on other parts of the brain may lead to serious consequences.

Even though the maternal blood may contain an adequate supply of oxygen, alterations in the pressure head at the placental site may prevent the fetus from obtaining its full requirements. During a uterine contraction, the pressure head which may be adequate in systole is quite inadequate during diastole.⁴ When the uterus contracts in labor accordingly, the oxygen supply to the fetus is greatly diminished, and manifestation of this diminution is revealed by changes in the rate and rhythm of fetal heart sounds. When the contractions are intense, or when they are prolonged, the difficulty is increased. This explains the frequent occurrence of stillbirths in precipitate labor, and also shows how posterior pituitary extract, when used during labor, causes the death of the child. These observations should lead us to attempt to diminish the violence of uterine contractions with small amounts of an anesthetic in cases of precipitate labor. They also indicate that posterior pituitary extract either should not be used, or should be used with great caution, during labor.

When in the course of labor, changes in the rate and rhythm of the fetal heart sounds indicate that the fetus is embarrassed, its oxygen supply may sometimes be increased by giving oxygen to the mother. The use of an anesthetic to diminish the intensity of the uterine contractions may also aid in this connection. If these measures fail, immediate delivery is indicated whenever the labor has progressed sufficiently far to warrant operative interference. If, as has been stated, in the large proportion of infants whose deaths were preceded by intermittent cyanosis and whose autopsies revealed nothing but congenital atelectasis, the real cause of death was a brain lesion caused by anoxia, appreciation of the physiologic principles outlined should lead the obstetrician to apply all of the measures which have been suggested to prevent and relieve anoxia. Appreciation of these principles also should direct the pediatrician's attention toward the advisability of prolonging the use of oxygen after respiration has been established, whenever anoxia is observed. If the pediatrician also is mindful of the fact that all respiratory stimulants do more harm than good, when the supply of oxygen is inadequate to support the metabolism of the brain cells, he will be very cautious in the use of such stimulants in the presence of anoxia.⁵

Effects of Prematurity

In addition to the cases which I have included under the heading of intermittent cyanosis, the premature deliveries contributed very materially to our infant mortality. Of the 200 stillbirths and neonatal deaths, 90 weighed between 1,000 and 2,500 grams. While less than a third of the stillbirths were in this class, prematures comprised almost 60 per cent of the neonatal deaths (Fig. 4).

As has been observed many times, the mortality of these underweight infants diminishes as the weight increases. Forty-six and six-tenths per cent of our cases in the 1,000- to 1,500-gram group were lost, while only 20.8 per cent of those weighing 1,500 to 2,000 grams, and 5.4 per cent of those in the 2,000- to 2,500-gram group died. Our gross mortality for the entire series was 12.4 per cent. Comparison of the results obtained in our series of 473

cases with those recorded in New York City for the year 1939 is shown in Fig. 5. In all groups our results were somewhat better than those of the entire city. The greatest difference, however, is to be observed in the 1,000- to 1,500-gram cases.

In a previous paper, many of the ways in which the obstetrician may aid in reducing the mortality of prematures were discussed.⁶ The most important of these are as follows:

1. Adequate supervision of the hygiene of pregnancy.
2. Proper advice concerning diet, coitus, rest, and exercise.
3. Immediate notification of the obstetrician whenever any untoward symptoms appear.
4. Early discovery of presence of syphilis, and vigorous treatment of the same throughout pregnancy.
5. Prevention of congestive failure in cardiac cases by joint cardiologist and obstetrician supervision.
6. Determination of the size of the child by means of the x-ray, and consultation with another competent obstetrician before artificially interrupting pregnancy.
7. Elimination of morphine, scopolamine, barbiturates, and general anesthesia in all premature labors.

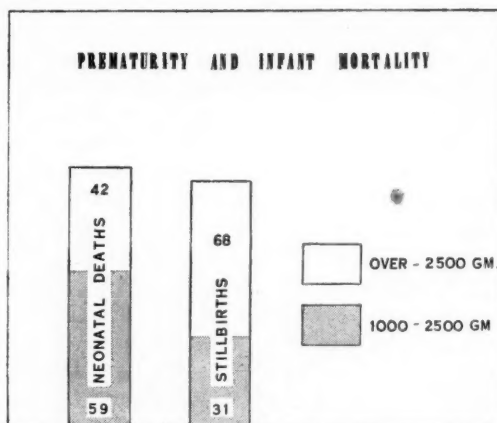


Fig. 4.

8. The administration of vitamin K to the mother before interrupting pregnancy and to all premature infants immediately after birth.⁷

9. Preservation of the membranes as long as possible and episiotomy to protect the premature infant from the pressure effects of labor.

10. Spontaneous delivery of the second twin and avoidance of version and extraction wherever possible.

11. Postponement of the tying of the cord until it stops pulsating in order that the child may receive as much blood from the placenta as possible.

12. Reception of the newly born premature infant in a tub of warm water to prevent chilling while waiting for the cord to stop pulsating.

While time will not permit a repetition of the discussion of all of these items, the effect of pressure on the brain of the premature infant and the effect of the various methods of delivery are sufficiently important to warrant further discussion of these significant items.

Pressure Effects

In the premature infant the blood vessel walls and the supporting structures of the brain are imperfectly developed. Not only are brain injury and intracranial hemorrhage more common in premature than in full-term infants, therefore, but the frequency and extent of the damage done, vary inversely with the duration of pregnancy. In other words, the smaller the fetus the greater will be the risk of brain damage during delivery. Although premature

births occurred only once in every 16 deliveries in our series, 50 per cent of all of the deaths which were due to brain injury were in prematurely born infants. Most of the danger is encountered in the second stage of labor and results from pressure of the soft and malleable head against the resisting pelvic floor. To prevent this type of brain injury and intracranial hemorrhage, the membranes should be preserved as long as possible and the second stage of labor should be terminated shortly after the head reaches the level of the ischial spines. The latter usually can be accomplished by doing an episiotomy under local anesthesia. Since this procedure removes most of the resistance at the outlet, it should be used in all cases. If the birth of the head does not follow soon after an episiotomy is done, extraction by low forceps is indicated.

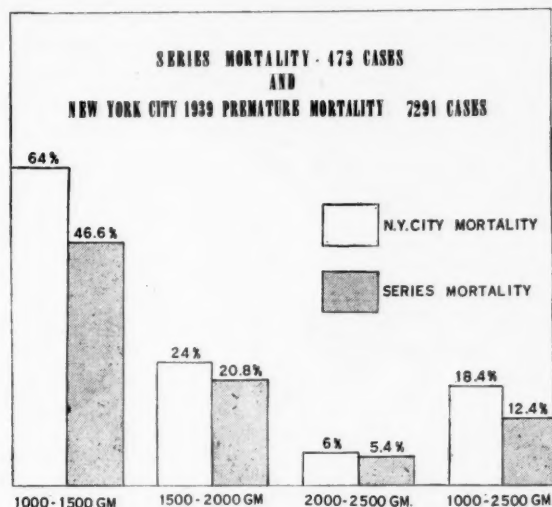


Fig. 5.

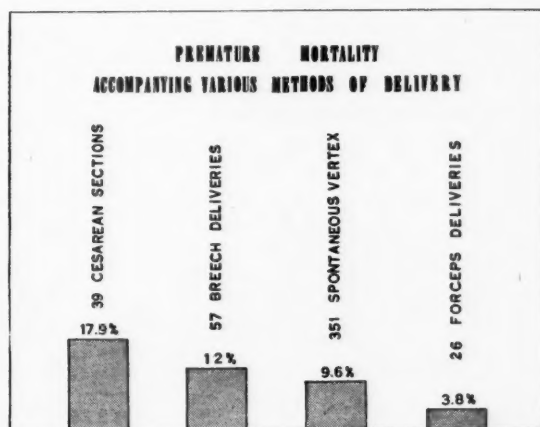


Fig. 6.

Effects of the Various Methods of Delivery

Fig. 6 is a graphic representation of the mortality of the various methods of delivery when the child is premature. This chart also illustrates how inaccurate statistics may be when they are compiled by a brainless tabulating and recording machine. According to these figures, forceps was the safest and cesarean section the most dangerous method of delivery, while breech deliveries were almost as safe as vertex. Careful study of the entire series, however, shows that these conclusions are erroneous.

Breech Deliveries

When the breech deliveries are broken down into the several 500-gram weight groups, it is noted that 70 per cent of the infants weighing 1,000 to 1,500 grams were lost, while the series mortality for this weight group was only 46.6 per cent. The mortality from breech

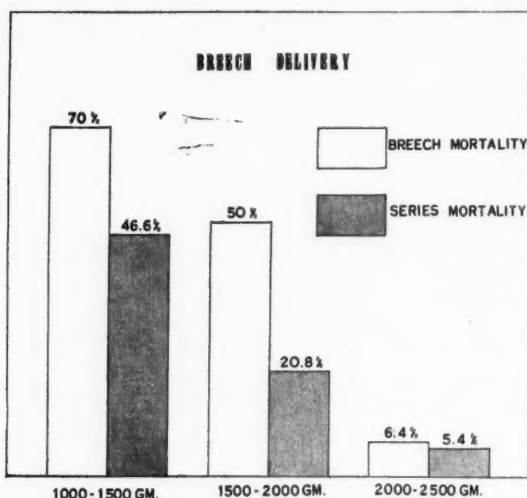


Fig. 7.

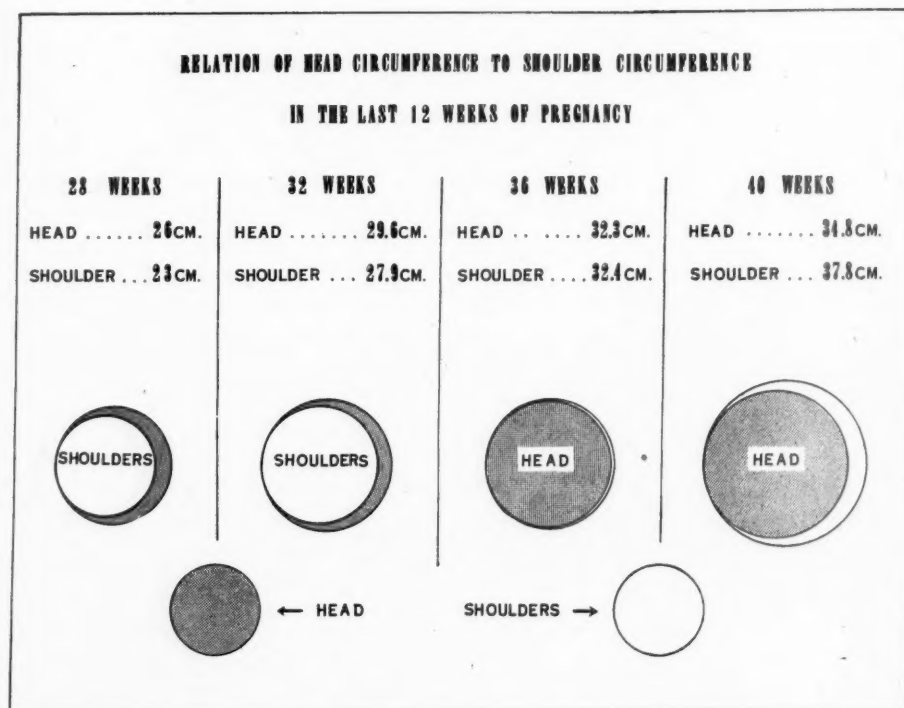


Fig. 8.

delivery of the infants weighing 1,500 to 2,000 grams was 50 per cent, or almost two and one-half times the mortality for the series infants of the same weight. It was only in the larger infants which weighed over 2,000 grams that the mortality of breech delivery approached

that of the series (Fig. 7). Instead of proving that breech delivery is almost as safe as vertex, this chart shows it to be an extremely dangerous method whenever the child is under 2,000 grams. The reason for the high death rate among these very small infants should be quite clear to all of us. Every obstetrician has observed that in the young prematures the circumference of the shoulders and body is less than the circumference of the fetal head. When the cervix is dilated sufficiently to permit the passage of the shoulders, therefore, it is not large enough for the head. The aftercoming head, accordingly, is caught by the cervix and the child either dies from asphyxia or from the injuries which are caused by the difficulties encountered in delivering the arrested aftercoming head. This point is well illustrated in Fig. 8. According to the measurements of Scammon and Caulkins the circumference of the shoulders at the twenty-eighth week is 3 cm. less than the occipitofrontal circumference of the child's head. At 32 weeks, the girth of the shoulders is still less than that of the head. Four weeks later, the shoulder circumference equals or slightly exceeds the head circumference, and at term there is observed the normal relationship in which the shoulder circumference is considerably greater than that of the head. The shaded areas represent the head, and the unshaded, the shoulder circumferences. Although both the head and the shoulders increase in size as pregnancy advances, the rate of the shoulder increase exceeds that of the head, with the result that the shoulder girth equals the girth of the head at 36 weeks and exceeds it at term.

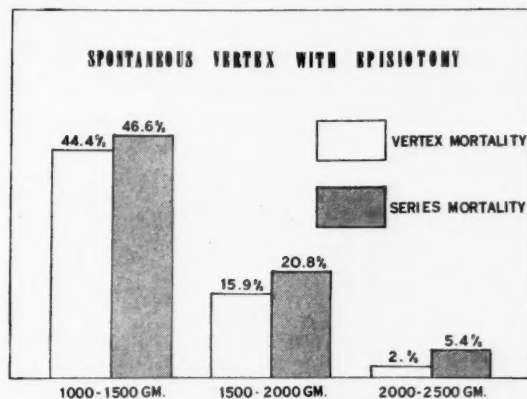


Fig. 9.

Vertex Deliveries

While 9.6 per cent of the 351 infants delivered as spontaneous vertex cases were lost, the mortality for the spontaneous vertex deliveries which were accompanied by episiotomy was lower than that of any other method of delivery. Although the death rate was only slightly below that of the series in the 1,000 to 1,500 gram cases, it was 20 per cent lower in the 1,500 to 2,000 gram group, and over 50 per cent lower than the series mortality in the infants weighing 2,000 to 2,500 grams (Fig. 9). The results in the 201 cases delivered in this manner are in accordance with our previous experience, which has shown spontaneous delivery with episiotomy under local anesthesia to be the safest method of delivery for the premature infant.

Cesarean Section

Thirty-nine cases were delivered by cesarean section with an infant mortality of 17.9 per cent. In three instances the child weighed only 1,000 grams and all three survived. The mortality in the 1,500 to 2,000 gram cases was slightly lower than the series mortality for the same weight group. A surprisingly high mortality of 20.8 per cent followed the use of cesarean section in the infants weighing from 2,000 to 2,500 grams (Fig. 10). This chart again shows the fallacy of drawing conclusions from plain figures without analyzing the circumstances of each case. Instead of showing a lowered mortality for the larger infants,

the mortality was considerably higher in this group. The reason for the poor results obtained by cesarean section was not due to the method of delivery, but was due either to the condition of the child, or to the maternal complication for which the cesarean section was done. Two of the 7 deaths were due to congenital anomalies, and in 3 instances in which the child was lost, the operation was done for placenta previa. Not only is the child subjected to intra-uterine anoxia in placenta previa, but, because of the mother's condition, the operation is done so rapidly that the ordinary technique which is followed when prematures are delivered by this method cannot be employed. If the 9 cases in which cesarean section was done for placenta previa and the 2 in which the child died as a result of congenital anomalies are deducted from the 39 cesarean sections, there remain 28 operations with 2 deaths, a premature infant mortality of 7 per cent. Cesarean section at times, accordingly, is a valuable method of delivery. It should be done under local anesthesia without preliminary sedation. The child should not be grasped by the feet and violently jerked out of the uterus. On the contrary, it should be delivered head first with as gentle manipulations as the circumstances will permit. If there is no bleeding from the placental site and usually there is none when the low technique is followed, the cord should not be severed immediately. While waiting for its circulation to take up some of the placental blood the child may be held by the feet so that whatever material is in the nasopharynx may drain away.

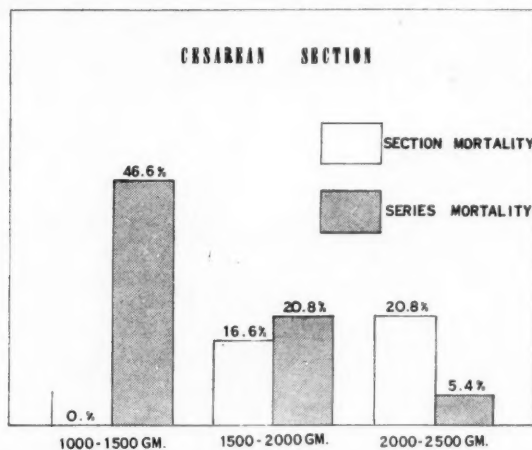


Fig. 10.

Summary

1. The annual maternal and infant mortality at the Long Island College Hospital is given for the five-year period from 1940 through 1944.
2. Anoxia and prematurity were the commonest causes of neonatal deaths.
3. The causes of anoxia and suggestions for its prevention and treatment are given.
4. The various measures which might reduce the incidence and mortality of premature births are outlined.
5. The cause and prevention of pressure effects on the head of the premature infant are discussed.
6. The results of the various methods of delivery of premature infants are compared.
7. Breech delivery is found to be most dangerous and the cause of the great danger of this method of delivery is emphasized.

8. Spontaneous vertex delivery accompanied by episiotomy under local anesthesia is the safest method of delivery for premature infants.

9. Cesarean section is not a dangerous but a valuable method of delivery. The high premature infant mortality which is recorded for this operation usually is due to the maternal or fetal complication which serves as the indication for the operation rather than to the method of delivery.

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STUDIES OF SURGICAL MORBIDITY*

II. Effect of Prostigmine on the Urinary Tract in Gynecologic Surgery

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URINARY tract infections are the most common complications following gynecologic surgery. In a previous study¹ the authors showed that 43 per cent of the identified morbid conditions in abdominal hysterectomies performed at St. Luke's Hospital were due to infections of the urinary tract. Residual urine, urinary retention, repeated catheterizations, and the symptoms resulting therefrom make a considerable problem for the gynecologist.

Gordon,² Marden and Williamson,⁴ and Tractenberg and Oliver,⁵ have reported the successful use of prostigmine methylsulfate for the relief and prevention of postoperative abdominal distention and urinary retention in abdominal and gynecologic surgery. It was thought that the "prophylactic" administration of prostigmine methylsulfate, as advocated by Gordon³ might prove of value in an attempt to control these postoperative complications.

The purpose of this study is to compare the effect of prostigmine methylsulfate† on the urinary tract of patients undergoing gynecologic surgery with a similar group undergoing the same type of surgery who did not receive the drug. The effect of prostigmine methylsulfate on postoperative abdominal "gas pains" was also studied.

Prostigmine methylsulfate may be described chemically as the dimethyl-carbamic ester of 3-hydroxyphenyl-trimethyl-ammonium methylsulfate. It is hereafter referred to in this study as prostigmine.

Methods and Material

There were 170 patients in the series; 50 per cent (85) received prostigmine, and 50 per cent (85) did not receive any so-called "prophylactic treatment."

The series included private and service patients; the latter both Negro and white. They were operated upon by the five attending gynecologists and the resident on the gynecologic service. The following method was employed:

One ampule (1 c.c. of the 1:2,000) of prostigmine was given with the preoperative medication, and one ampule was given immediately on return from surgery. Following abdominal operations one ampule was given every six hours for forty-eight hours. Following vaginal operations one ampule was given every four hours for forty-eight hours. All doses were given intramuscularly.

For the sake of simplicity, the types of surgery were divided only into abdominal and vaginal procedures. Abdominal surgery included total and subtotal hysterectomy, salpingectomy, oophorectomy, and miscellaneous abdominal procedures. Vaginal surgery included vaginal hysterectomy and all forms of vaginal plastic operation, i.e., perineorrhaphy, trachelorrhaphy, colporrhaphy, vulvectomy, and combinations of these procedures.

*Presented before a meeting of the Chicago Gynecological Society, Dec. 15, 1944.

†The prostigmine methylsulfate used in this study was furnished by Hoffman-La Roche Company, Nutley, New Jersey.

Urinary Tract Morbidity

In order to be classified as having a urinary tract infection the patient had to have (1) clinical symptoms of dysuria and frequency, and/or urgency and burning on urination, and (2) laboratory findings of more than 20 mg. of albumin and more than 10 white blood cells per high-power field on two or more postoperative days. To be called a "morbidity" the patients, in addition, had to run a temperature of 100.4° F. for two consecutive days postoperatively.

Whether cystitis per se causes a rise in temperature or not remains a matter of urologic controversy. It is claimed that, because of the inability of the bladder mucosa to absorb toxins, the temperature elevations in infections of this kind are due to involvement of other parts of the urinary tract or to an entirely different cause. After studying a number of these types of infection in a previous study, the authors noted that in patients with evidence of postoperative urinary tract infection the majority of them developed a rather characteristic temperature rise on the fourth or fifth postoperative day. We feel that without further investigation involving considerable instrumentation, one cannot definitely say these infections are limited to the bladder. It is well within the realm of probability that the toxins are absorbed from the more receptive walls of the ureters or pelves of the kidneys. We have preferred to use the term "urinary tract infection" rather than cystitis for this reason.

TABLE I. MORBIDITY

	GROSS MORBIDITY			URINARY TRACT INFECTIONS	
	NUMBER	NUMBER MORBID	PER CENT MORBID	NUMBER MORBID	PER CENT OF GROSS MORBIDITY
<i>A. Receiving Prostigmine</i>					
Abdominal	58	23	39.8	7	30.43
Vaginal	27	10	37.0	9	90.0
Total	85	33	38.8	16	48.4
<i>B. Untreated</i>					
Abdominal	58	18	31.0	2	11.1
Vaginal	27	7	25.9	3	42.8
Total	85	25	29.40	5	20.0

Table I shows the morbidity rate of the patients who received prostigmine as compared to those who did not. It also shows the morbidity rate for the abdominal and vaginal operations. The table likewise shows the relation of urinary tract infections to the gross morbidity. The patients who received prostigmine had a gross morbidity rate of 38.8 per cent, while those who did not receive the drug had a gross morbidity rate of 29.4 per cent. For the group receiving prostigmine the percentage of morbidities that were due to urinary tract infections was 30.4 per cent for the abdominal operations and 90 per cent for the vaginal operations. For the untreated group the urinary tract infections comprised only 11.1 per cent of the abdominal operation morbidities and 42.8 per cent of the vaginal operation morbidities.

The effect of prostigmine on the postoperative urinary findings is shown in Table II. The laboratory findings are classified as negative or positive, with the latter being graded quantitatively on the basis of I to IV. It is seen that there is very little difference between the two groups. There were 66 patients in the treated group who had positive laboratory findings, and 64 such patients in the untreated group. This was considered an objective estimation of the effect of the drug as it presented the opportunity of estimating the amount of pus and albumin found postoperatively in the urine.

TABLE II. POSTOPERATIVE URINARY FINDINGS

RECEIVING PROSTIGMINE							UNTREATED					
NEG. LAB		POSITIVE LAB.				NEG. LAB.	POSITIVE LAB.					
FINDINGS		FINDINGS				FINDINGS	FINDINGS					
		GRADE	I	II	III	IV		GRADE	I	II	III	IV
Abdominal	14		20	19	4	1	18		17	17	5	1
Vaginal	5		5	10	6	1	3		5	16	3	0
Total	19		25	29	10	2	21		22	33	8	1

Not all of the patients with positive urinary findings developed the clinical symptoms of urinary tract infection. The individual symptoms of dysuria, frequency, urgency, and burning were taken collectively and classified simply under a general heading of symptoms. Of the 170 patients, there were 84 who had urinary symptoms following surgery. There were 40 such patients in the group receiving prostigmine and 44 patients in the untreated group, indicating no marked difference between the two groups. There was no perceptible difference as to the severity of the symptoms in the two groups.

There were a number of patients in the series who developed all the clinical symptoms of urinary tract infection as well as positive laboratory findings, but who did not show the temperature rise which is usually seen on the fourth or fifth postoperative day. There were nine such instances in the patients who received prostigmine, and eight in the untreated group.

The patients who did not receive prostigmine were on the following catheterization schedule: If they did not void spontaneously within ten hours postoperative, they were catheterized. Once catheterized, catheterization was repeated every eight hours until the "residual urine" was under 150 c.c. and then twice a day until it was under 30 c.c. If, on the first catheterization, less than 30 c.c. was obtained, the catheterization was not repeated. All patients were catheterized at once for distress or distention. If, after voiding, a patient was found to have over 30 c.c. of urine remaining in the bladder, this was considered significant and was called "residual urine." This is in contrast to "retention urine" which is the amount of urine obtained from a patient who is unable to void.

The group of patients receiving prostigmine was divided into two subgroups, A and B. The patients in subgroup A were subjected to catheterization following each voiding; every eight hours if the patient did not void, and as necessary for distress or distention. The subgroup B patients were catheterized only once a day for "residual urine," usually at the hour of sleep, and were not catheterized during the rest of the twenty-four-hour period unless they were distressed or distended.

These groups were established for the purpose of determining the amount of urine (1) residual in the bladder after each voiding, and (2) the amount accumulated or retained in a twenty-four-hour period.

TABLE III. AVERAGE VOLUME AND NUMBER OF CATHETERIZATIONS

	ABDOMINAL	VAGINAL
<i>Untreated</i>		
Average No. of cath. in 10-day period	10.5	16.7
Average c.c. per cath.	187	261
<i>Receiving Prostigmine</i>		
Average No. of c.c. per cath.		
Subgroup A	153	261
Subgroup B	128	127
Patients who voided spontaneously but were cath. c.c. per cath.	167	130

The average amount of urine obtained per catheterization was computed. The figures were obtained by averaging individual catheterizations in each group for the first ten postoperative days. Table III shows the results of these computations. The average number of catheterizations in the untreated group was 10.5 times for the ten-day postoperative period

in the abdominal operations, and 16.7 times for the same period in the vaginal procedures. The average amount of urine obtained in the abdominal operations was 187 c.c. per catheterization, and in the vaginal operations 261 c.c. in the untreated groups.

The average number of catheterizations for the group receiving prostigmine was not computed because every patient receiving prostigmine was subjected to catheterization according to the subgroup in which the patients were alternately placed.

In the groups receiving prostigmine it was found that in subgroup A, or the patients catheterized after each voiding, the average amount of "residual urine" obtained on catheterization was 153 c.c. per catheterization for the abdominal procedures, and 261 c.c. per catheterization for the vaginal procedures. In subgroup B, or the group catheterized once daily at the hour of sleep, the average amount of urine obtained on each catheterization was 128 c.c. for the abdominal operations, and 127 c.c. for the vaginal operations. It is observed that the average amount of urine obtained in the vaginal group was much less in those who were catheterized only once a day than in subgroup A.

It has been thought that if a patient voided spontaneously within the first ten hours postoperatively, there was no need to catheterize her unless symptoms of urinary distress appeared. In 38 patients who voided spontaneously within twelve hours postoperatively, and were also catheterized, the average amount of "residual urine" was 167 c.c. per catheterization in abdominal operations and 130 c.c. per catheterization in vaginal procedures.

There were 21 patients who did not receive prostigmine but voided spontaneously and did not have any catheterizations. They had a gross morbidity rate of 43 per cent as compared to a morbidity rate of 29.4 per cent for the untreated group as a whole. It is difficult to evaluate this group for, in the absence of catheterizations and lack of symptoms of urinary tract distress, the urinary tract cannot be blamed or exonerated as the etiological factor of morbidity. In view of the fact that patients who voided spontaneously and were catheterized showed a definite "residual urine," one can assume these patients also ran a "residual urine" with its potential dangers. It cannot be said, however, that the urinary tract was responsible for the morbid condition in these cases.

Abdominal "Gas Pains"

To study the effect of prostigmine on "gas pains" an arbitrary classification was set up. Based principally on the patient's complaints as to the severity of the pains, the discomfort was classified on the basis of I to IV. Table IV shows the number of patients in each of the groups in relation to the severity of pain, distribution, and general abdominal discomfort. It would appear that in the group receiving prostigmine there was some diminution in the severity of pains; in Group II the number is considerably diminished. In Groups III and IV, or most severe pains, the number is twice as high in the group receiving prostigmine.

TABLE IV. POSTOPERATIVE ABDOMINAL "GAS PAINS"

	RECEIVING PROSTIGMINE					UNTREATED				
	NONE	GRADE				NONE	GRADE			
		I	II	III	IV		I	II	III	IV
Abdominal	18	9	17	11	2	9	5	49	5	0
Vaginal	12	3	11	1	0	16	2	8	1	0
Total	30	12	28	12	2	25	7	57	6	0

Discussion

The importance of the postoperative care of the urinary bladder following gynecologic surgery is well recognized by all surgeons doing this type of work. "Residual urine" has long been emphasized as the principal cause of urinary

tract infections. Nearly twenty-five years ago Curtis⁶⁻⁸ showed that the number of urinary tract infections resulting from "residual urine" was far greater than the infection arising from repeated catheterizations. He brought out the important fact that the catheter itself is not the principal source of infection, but that the danger lies in the retention of urine in the bladder, comparable to the "sink which drains inadequately."

Because of the bladder's precarious position lying anterior to the uterus, it is subjected to traumatization in both abdominal and vaginal surgery. In addition to injury to the bladder from instruments and dissection, the innervation of the bladder is disturbed in gynecologic operations. Although the innervation of the bladder remains a urologic controversy, it is generally assumed that the parasympathetic nerves from the hypogastric vesical plexus are responsible for the contractibility and tone of the bladder. Since these nerves enter the bladder under the lateral reflection of the pelvic peritoneum, it is understandable why the bladder physiology is disturbed following pelvic surgery.

Prostigmine methylsulfate is a parasympathetic stimulator. It has been thought, therefore, that this drug would restore the tones of the bladder and initiate voiding following surgical procedures in the pelvis. Experimentally, Bross and Kubikowski⁹ have shown that prostigmine causes contraction of the excised bladder in the rabbit and guinea pig. It has been felt that if bladder tone could be maintained following surgery, postoperative urinary retention could be avoided.

In our series of patients the effect of prostigmine was studied from several aspects. It is seen (Table I) that the morbidity rate was not decreased by the use of the drug in either the abdominal or the vaginal procedure. The morbidity rates in each of the groups is comparable to the over-all morbidity rates for hysterectomy found by the authors in a previous study.¹ The causes of morbidity show that the group receiving prostigmine had three times the incidence of cystitis as did the untreated group. These were cases of proved urinary tract infection with the temperature rises characteristic of this condition. There were approximately the same number of patients in each group who developed cystitis without a temperature rise.

The vaginal procedures as a group showed a lower incidence of urinary tract infection than was expected, but the group receiving prostigmine developed a high number of bladder infections.

In examining the laboratory findings of the urine postoperatively, where the findings are graded negative or positive on the basis of I to IV according to the quantitative findings, there is practically no difference between the treated and untreated groups. From this part of the study, it is evident that prostigmine did not materially affect the postoperative urinary laboratory findings.

A more subjective approach to the problem is through the study of postoperative urinary symptoms. Both Curtis⁸ and Danforth¹⁰ emphasize the importance of urinary distress, urgency, frequency, and dysuria, in determining the ability of the patient to empty her own bladder. It is seen from the study that there was little difference between the treated and untreated groups as to

the development of urinary distress following surgery. While more of the patients undergoing vaginal procedures were free of urinary discomfort in the untreated group, the abdominal operations had a somewhat higher incidence of symptoms in the group receiving prostigmine.

It has been taught that a patient voiding spontaneously within ten hours postoperatively, and free of urinary distress, does not need to be catheterized. It was believed that this type of patient emptied her bladder, and, if not catheterized, remained free of urinary tract infection. Curtis⁸ states: "If the patient suffers no discomfort from inability to urinate after her return from the operating room there is no need for catheterization; moreover, the bladder tends to remain free from infection until a catheter has been used." Danforth says: "After operation, if the bladder is emptied spontaneously, and if no vesical discomfort is felt, it may be left undisturbed."

In the group receiving prostigmine, catheterizations were carried out in all patients whether they voided spontaneously or not. It was found that the patients who voided spontaneously carried a rather large amount of "residual urine." It was shown that in these patients the amount of urine obtained by catheterization after spontaneous voiding within ten hours postoperatively was similar to that obtained from patients catheterized because of urinary retention or distress. Therefore, the mere fact that the patient voids spontaneously does not eliminate the potential danger of "residual urine." It is often assumed that if the patient is voiding freely without symptoms of urinary distress, the bladder is emptying itself and cannot be held responsible for an insidious temperature. The authors feel that this problem of "residual urine" in patients with spontaneous voiding following surgery is of fundamental importance. It can be eliminated only by constant awareness of its existence. They feel, as Curtis has repeatedly stated, that the principal danger in postoperative urinary tract infection lies in the "contaminated sink" of the unemptied bladder.

The importance of careful catheterization technique in this regard cannot be too strongly emphasized. Unquestionably, faulty catheterization technique without proper aseptic precautions is responsible for a high percentage of urinary infections. With proper asepsis the risk is minimal. It cannot be said that the use of the catheter does not cause cystitis and urinary tract infection. Catheterization can, and does, introduce bacteria into the bladder and urinary tract. It is a question which is the greater evil, the catheterization or the "residual urine," retention, and distention.

We felt that the patients receiving prostigmine were benefited as far as "gas pains" were concerned. This was the conclusion from the semiobjective classification of the severity of the patient's discomfort and the subjective observation of those who were charged with the care of the patient. It was also observed, and brought out in Table IV, that when a patient apparently had an intestinal obstruction, functional or mechanical, the use of prostigmine tended to increase the severity of the pain, and relief was not obtained until the obstruction was relieved. This is to be expected from the physiologic action of the drug and accounts for those patients whose pains fell in Grades III and IV in the treated group.

Conclusions

1. A study of the effect of prostigmine on the urinary tract following gynecologic surgery is presented, with 85 patients receiving the drug and 85 patients used as controls.
2. The incidence of postoperative urinary distress was the same in the treated as in the untreated group.
3. The postoperative urinary laboratory findings were the same for both groups.
4. The incidence of postoperative spontaneous voiding was the same in both groups.
5. "Gas pains" were somewhat lessened in the patients receiving prostigmine, but where obstruction existed, the discomfort was increased by prostigmine.
6. The amount of "residual urine" was found to be the same in the patients who voided spontaneously as in those who had to be catheterized for urinary distress or distention.
7. Prostigmine was ineffective in preventing postoperative urinary infections as it was used in this study.

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104 S. MICHIGAN AVENUE

Discussion

DR. VINCENT J. O'CONOR.—In the expulsion of ureteral calculi, prostigmine seems to have been of great help where the lower end of the ureter is not constricted, and where the ureter has been previously dilated, and the orifice enlarged. We have been surprised by having very sizable stones pass after injection of prostigmine. At other times, we have had very discouraging results when we thought prostigmine should have given us more aid than it did.

These clinical papers point out that, in spite of the parasympathetic effect which prostigmine has on the bowel and perhaps the ureter, a comparable effect on the bladder is not obtained. Nesbit and Cummings of Ann Arbor gave a paper at a meeting of the Genito-Urinary Surgeons in which they compared 235 patients with appendectomy, in which 17.5 per cent required postoperative catheterization, with 65 cases in which prostigmine was used as a prophylactic and therapeutic agent. The doses given in their series were much the same as Drs. Jones and Doyle have used, namely, 1 c.c. thirty-six hours before operation, 1 c.c. every four hours postoperative, and then 1 c.c. every six hours. If the patient developed discomfort and did not void, he was given a dose every hour. Quite a large percentage still required catheterization. In Gordon's series, 18.5 per cent required catheterization. Both of these series paralleled the findings of Drs. Jones and Doyle.

I would like to ask the gynecologists a few questions from a urologic point of view in regard to catheterization. How long should a patient be allowed to go before catheterization is performed? What procedures are used to encourage spontaneous urination other than prostigmine? Has postural help been given? Has stimulation of the rectal sphincter been given by means of a low return-flow enema or warm glycerin per rectum? How often do you use hot vaginal douches, a procedure that we all know will stimulate urination? It seems to me that a study which has to do with the incidence of catheterization must take into consideration the history and clinical problems of the patient. It is a question of judgment as to when to catheterize.

Catheter technique seems to me to be the real problem that faces us in regard to the figures of postoperative morbidity associated with catheterization. Everyone admits that catheterization properly done should be a nontraumatic and a noninfection-producing procedure except perhaps in cases with definite paraurethral gland infection or a circumscribed urethritis.

In many places they put 2 per cent aqueous mercurochrome into the bladder. Even when placed in a normal bladder some patients will get a violent reaction, with hyperemia, which will add to the bladder neck obstruction. I have been in hospitals where I see them routinely using $\frac{1}{4}$ to $\frac{1}{2}$ per cent silver nitrate solution. This is not rational. If you introduce silver nitrate into the bladder, urethra, or kidney pelvis over a period of time, you will have a precipitate of silver in the mucosa, with a resulting round-cell infiltration. If you are trying to stimulate the mucous membrane to free itself of a chronic interstitial infection, then there is some rationale for putting silver salts against the mucosa, but is it a good prophylactic procedure when you are introducing it for catheterization?

Just as a matter of interest I picked up some catheters that are used in the hospital. If you look at the instrument case you will see that 50 per cent of the catheters have been boiled and boiled to a point where they do a figure-of-eight when inserted into the bladder. There are catheters made especially for women and, if they are properly sterilized and properly handled, and the nurses are instructed in their use, there will be less chance of causing trauma to the urethra.

If a patient persists in showing residual urine after several catheterizations, intermittent catheterization should be done. If you are going to perform intermittent catheterization, is eight hours often enough? Are you correlating the patient's intake with the amount of urine obtained at catheterization? One patient may not total 200 c.c. in eight hours, while another patient may have 1,000 c.c. in the bladder at that time.

How do we know that 150 c.c. of residual urine is more harmful to the patient than 30 or 60 c.c. of residual urine, provided the patient is not having distressing symptoms? Whatever injury or dysfunction occurs in most of this pelvic surgery, we all agree, is a transitory thing. Our objective should be to devise a method of management so that when the patient's bladder tone and vis a tergo returns to normal, as it does in practically all instances, the patient will not have acquired some permanent dysfunction or inflammation as a result. We should supervise the management and follow it through in such a rational way that late urinary pathology does not result.

CYCLIC VARIATIONS IN THE VISCOSITY OF CERVICAL MUCUS AND ITS CORRELATION WITH AMOUNT OF SECRETION AND BASAL TEMPERATURE*

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THE event of ovulation is doubtless of greater biologic significance than the more apparent phenomenon of menstruation, for upon its occurrence depend the periodic intervals of fertility. The egg, after leaving the ovary, cannot for long await the arrival of the sperm. Hence, for a planned pregnancy, the meeting of the egg and the sperm must coincide with the time when the former is susceptible to fertilization.

In the investigation of sterility of the female it is important to know if and when ovulation is occurring. Menstruation without ovulation is not uncommon. Furthermore, the fertile period in one cycle may not correspond to that in another cycle, even in the same individual. Although actual observation of ovulation is not clinically practicable, it is nevertheless possible with indirect methods to determine its occurrence by a study of related phenomena. Thus, familiar tests such as endometrial biopsies, vaginal smears, and hormone assays may well tell of the period of ovulation. Observation of the shift of the basal body temperature offers a less troublesome and time-consuming method for recognizing this period of the menstrual cycle in many women.

Séguy and Vimeux,¹ in 1933, reported cyclic changes in the amount of cervical mucus in normally menstruating women. A great increase in quantity was observed between the tenth and fifteenth days of the menstrual cycle. At this time the mucus is glairy, transparent, and relatively acellular. In a later paper Séguy and Simonnet² correlated this phenomenon of increased mucus production with an increase in urinary folliculin and evidence of ovulation as verified by inspection of the ovaries at laparotomy. These observations were confirmed by Lamar, Shettles, and Delfs,³ who extended them by noting with *in vitro* studies, that spermatozoa can penetrate the mucus to an appreciable distance only during this period of increased secretion associated with low viscosity, and during menstruation.

The present authors⁴ made daily observations on a series of normal subjects and determined the quantity of cervical mucus present by objective methods. These data were correlated with the basal body temperature curves, and it was noted that the period of the cycle when the amount of mucus is greatest corresponds to the time of the temperature shift from a lower to a higher level, i.e., the presumptive time of ovulation.

On the basis of previous work,³ it would appear that the viscosity of the cervical mucus is an important factor in determining its penetrability by

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spermatozoa. No satisfactory method has been available for measuring this physical characteristic, and, as a result, workers in the past have estimated the viscosity as high, moderate, or low, depending upon the ease with which the mucus could be drawn into a small capillary tube. Cervical mucus is not a homogeneous substance. Fractions of a single sample may vary in consistency as does the white of an egg. Opalescent areas, having a thicker consistency than the adjacent more fluid portion, may be clearly visible to the naked eye. The tackiness, also a variable factor, may likewise influence the rate of flow of the mucus. But more important, the quantity of material available for study may frequently be as little as 25 to 50 milligrams. These facts doubtless have been the reasons why a suitable objective method for the measurement of the viscosity of cervical mucus has not been employed heretofore.

The method described below has circumvented at least some of these difficulties and has proved useful in determining the cyclic variations in the viscosity of cervical mucus in normal women.

Subjects

During the course of this study four young healthy women were used as subjects. With but few exceptions, aside from the time of menstruation, daily observations were made. One subject was followed through two cycles, and the other three, through four cycles each.

Methods

Basal Body Temperature.—Each subject took her basal vaginal temperature in the morning before arising. The Fahrenheit scale was read to the nearest 0.1 degree. The shift in temperature from a relatively lower level during the follicular stage to a relatively higher level, where it is maintained throughout the progesterational phase, is held to mark the approximate time of ovulation.^{5, 6} Due allowance must, however, be accorded any intervening infection, which of itself might affect the temperature and thereby obscure the ovulatory temperature shift. The menstrual periods and the temperature shift were taken as more or less fixed points of reference in each cycle.

Collection of Material.—An unlubricated speculum is inserted into the vagina to expose the cervix. Mucus from the cervix is drawn by aspiration into a weighed glass cannula, the amount being determined by difference. An attempt is made in each case to evacuate the cervical canal completely, a second cannula being used when necessary. The mucus covering the external os is considered along with that from within the canal in the determination of the total quantity present. Because mucus at the external os may well be altered by the vaginal environment, only that mucus which is obtained from within the canal has been used in the viscosity studies.

Viscosity.—The apparatus for measuring viscosity is shown in Fig. 1. A glass capillary tube approximately 0.4 mm. in internal diameter and about 15 cm. in length is mounted in a horizontal position on a wooden block (a) alongside of which is fixed a millimeter scale. The capillary tube is fused to a tube of slightly wider bore in which a stopcock is inserted. This in turn is connected through an airtight 500 c.c. flask (c) to a mercury manometer (d). The flask serves to keep the pressure constant in the system.

Since the viscosity of cervical mucus is so much greater in the preovulatory and postovulatory phases than in the ovulatory period, no one reference fluid is applicable throughout the cycle. As used here, the term viscosity is defined as the time in seconds required to draw a column of mucus through the capillary tube a given distance at a given pressure as measured on the mercury manometer.

The mucus, after being expelled from the cannula, is placed in the wide end of the small funnel, which is then placed horizontally in position so that the tip of the capillary dips into the mucus. Sufficient pressure is applied to draw the mucus into the capillary. Due to the viscid nature of the mucus it is difficult to fill the capillary to exactly the same length each time, but a column of approximately 4 cm. is usually used. Because the mucus does not break cleanly, it is necessary to cut the thread of mucus between the capillary and the funnel when the latter is removed. The tip of the capillary is then wiped clean. The time in seconds for the head of the column to travel 3.0 cm. under a given pressure is measured with a stop watch.

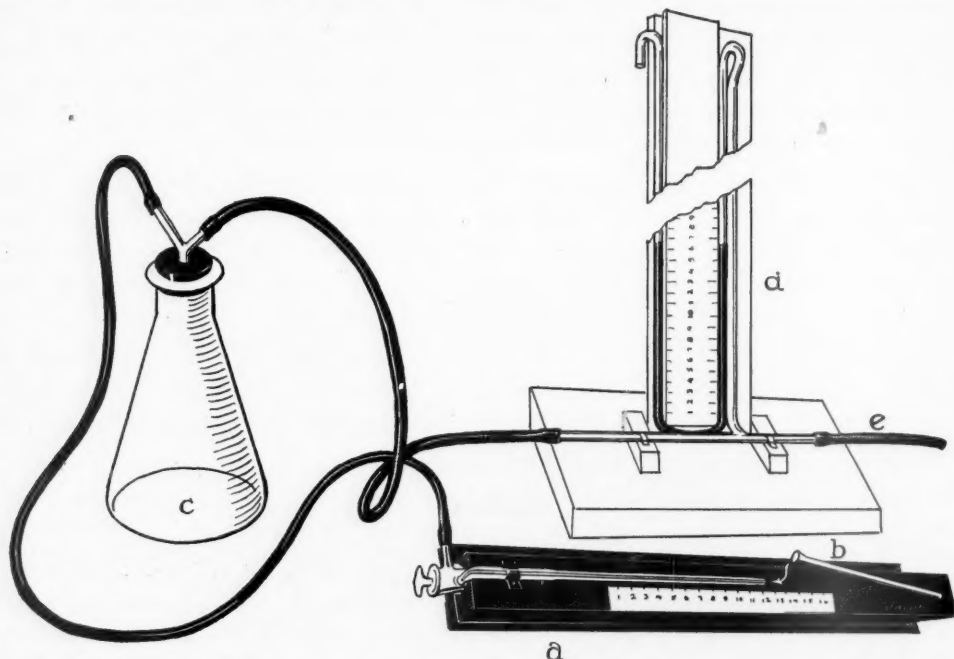


Fig. 1.—Apparatus for measuring the viscosity of cervical mucus. *a*, Capillary tube mounted horizontally on wooden block with millimeter scale in position; *b*, funnel used as reservoir for filling capillary; *c*, 500 c.c. air-tight flask; *d*, mercury manometer; *e*, outlet for applying suction.

A pressure of 4.1 cm. of mercury is used whenever possible. If this is insufficient due to a marked increase in the viscosity of the mucus, pressures of 6 or 8 cm. are used. It is difficult to draw up the column of mucus intact because of its adhesiveness. To correct for the loss on the walls of the capillary tube, the length of the column is noted at the beginning and again at the end of the determination, and the average of these two figures is used in the calculation.

In order to compare the daily determinations, all observations are corrected to conform with arbitrarily chosen standards. A pressure of 4.1 cm. of mercury is used as the standard as the majority of samples can be measured directly at this pressure. It has been determined that, in about 80 per cent of the cases, the time required to draw up the column of mucus is approximately inversely proportional to the pressure. Therefore, when a higher pressure is used, the appropriate correction is applied. An average length of 4.0 cm. has been chosen as the standard column length. Experiments show that the time required to move the column of mucus is directly proportional to the length of the column. Therefore, when the average column length is not 4.0 cm., the appropriate corrections are made. The distance of 3.0 cm. for the column of mucus to travel seems best adapted to the equipment.

Duplicate observations were made whenever possible. Inasmuch as it requires 25 to 30 mg. of material for a single determination, duplicate determinations usually cannot be done except during the period of increased secretion.

Experiment has shown that the viscosity is altered when the mucus is permitted to stand for more than several hours. For this reason determinations should be performed promptly.

Penetrability.—The method of Lamar, Shettles, and Delfs³ has been used for observing in vitro the penetrability of cervical mucus. A small amount of mucus is drawn up into a capillary tube of 0.3 to 0.4 mm. internal diameter. A column of fresh semen is then drawn in, leaving a small bubble of air between the mucus and the semen to prevent mechanical mixing and also to serve as a reference point in observing the penetration. The time at which the capillary is prepared is noted. The capillary tube is then placed on a slide, covered with mineral oil to reduce refraction, and the penetration of the sperm into the mucus is observed through the microscope. By using a stop watch and a calibrated mechanical stage, the rate of penetrability can be measured.

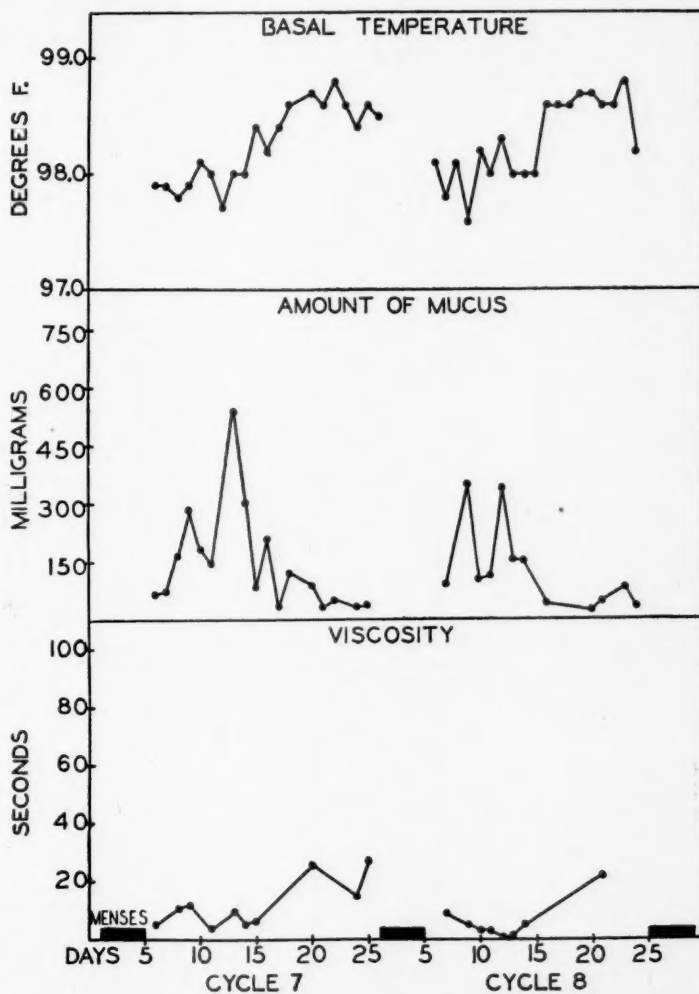


Fig. 2.—Relation between basal temperature, amount and viscosity of cervical mucus for Subject 5, a 32-year-old gravida 1. Cycles 7 and 8 were consecutive.

Results

A total of 14 cycles on four subjects have been studied. The results are shown in Figs. 2, 3, 4, and 5. Because the time of the ovulatory period may vary from one cycle to another even in the same individual, each cycle is shown separately so that the marked changes are more sharply delineated.

Inspection of the curves shows that there are characteristic cyclic fluctuations in basal temperature, amount and viscosity of mucus. Fairly constant points are noted to occur at about the middle of each cycle in practically every instance. Occurrence of these shifts at approximately the same time suggest that they are associated phenomena. Since they occur at the supposed time of ovulation, it seems probable that they are related to this event.

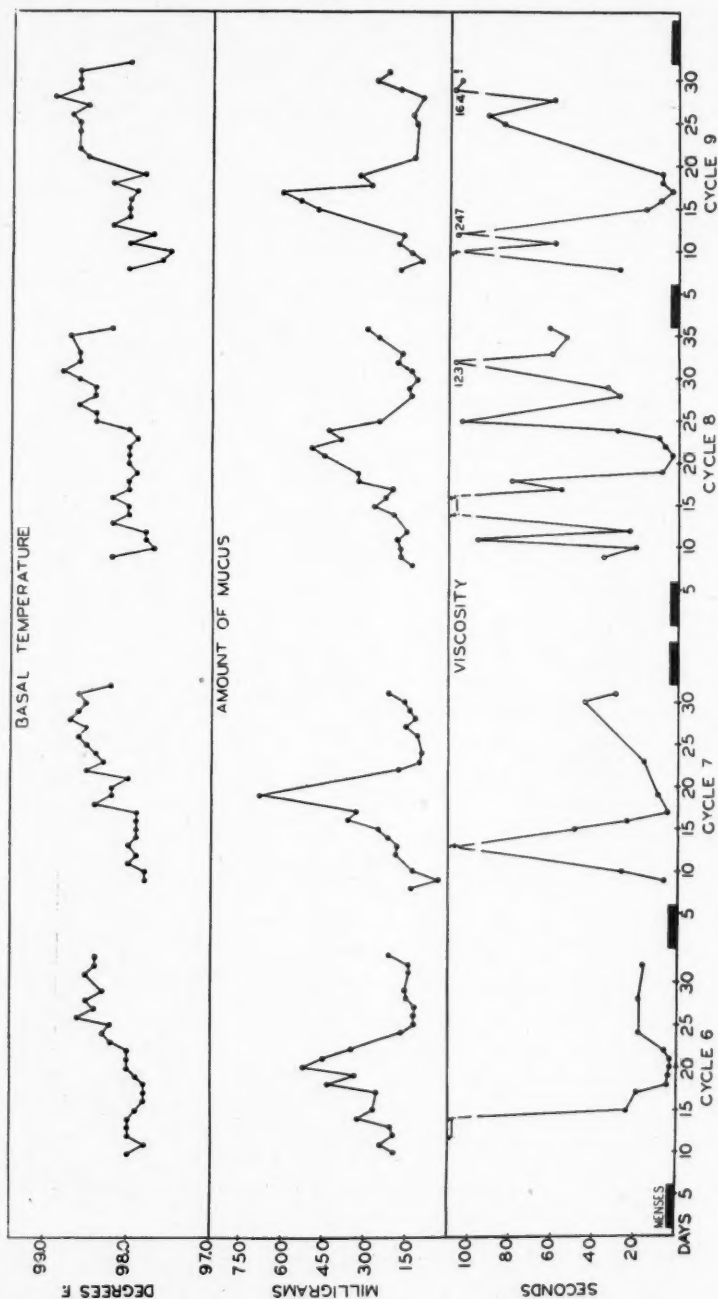


Fig. 3.—Relation between basal temperature, amount and viscosity of cervical mucus for Subject 6, a 25-year-old nullipara. Cycles 6 and 7 were consecutive, as were Cycles 8 and 9. In the viscosity curve, *p* indicates that the viscosity was beyond the range of the method, and *o* indicates that a pressure greater than 4.1 cm. was necessary to move the column, the appropriate corrections having been applied.

The relation between the decrease in viscosity and the increase in amount of mucus is especially close, the two phenomena occurring almost simultaneously. Studies now in progress indicate that the water content of the mucus also increases at this time. The viscosity was

measured on specimens of mucus obtained on 163 different days. On 47 other days insufficient mucus was obtainable from the canal to do determinations. Inasmuch as the amount is increased during the ovulatory period, it follows that these 47 days were from the other phases of the cycle. In 39 of the 163 instances a pressure of 4.1 cm. of mercury was inadequate

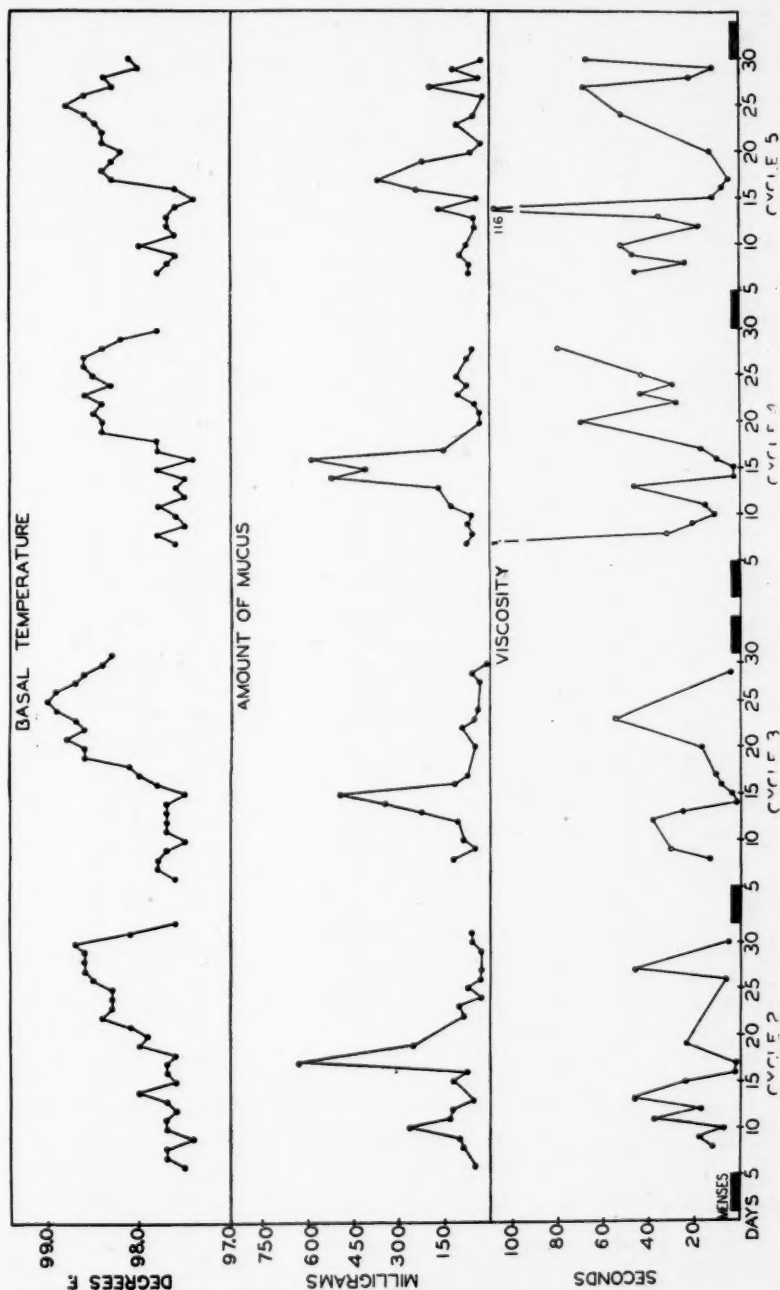


Fig. 4.—Relation between basal temperature, amount and viscosity of cervical mucus for Subject 7, a 24-year-old nullipara. Cycles 2 and 3 were consecutive, as were Cycles 4 and 5. Symbols as explained under Fig. 3.

to pull the column of mucus up the capillary tube. Only 1 of the 39 occurred during the ovulatory period, the remainder being about equally divided between the preovulatory and the postovulatory phases. Enough material to do duplicate determinations was obtainable on 59 days. Of these, 62.7 per cent checked within 3 seconds and 72.9 per cent checked within

5 seconds. Considering the heterogeneous character of cervical mucus, checks of 5 seconds or less were considered satisfactory.

Small day by day fluctuations in basal temperature, amount and viscosity of the mucus may be noted in the preovulatory and postovulatory phases of the cycle. Although they

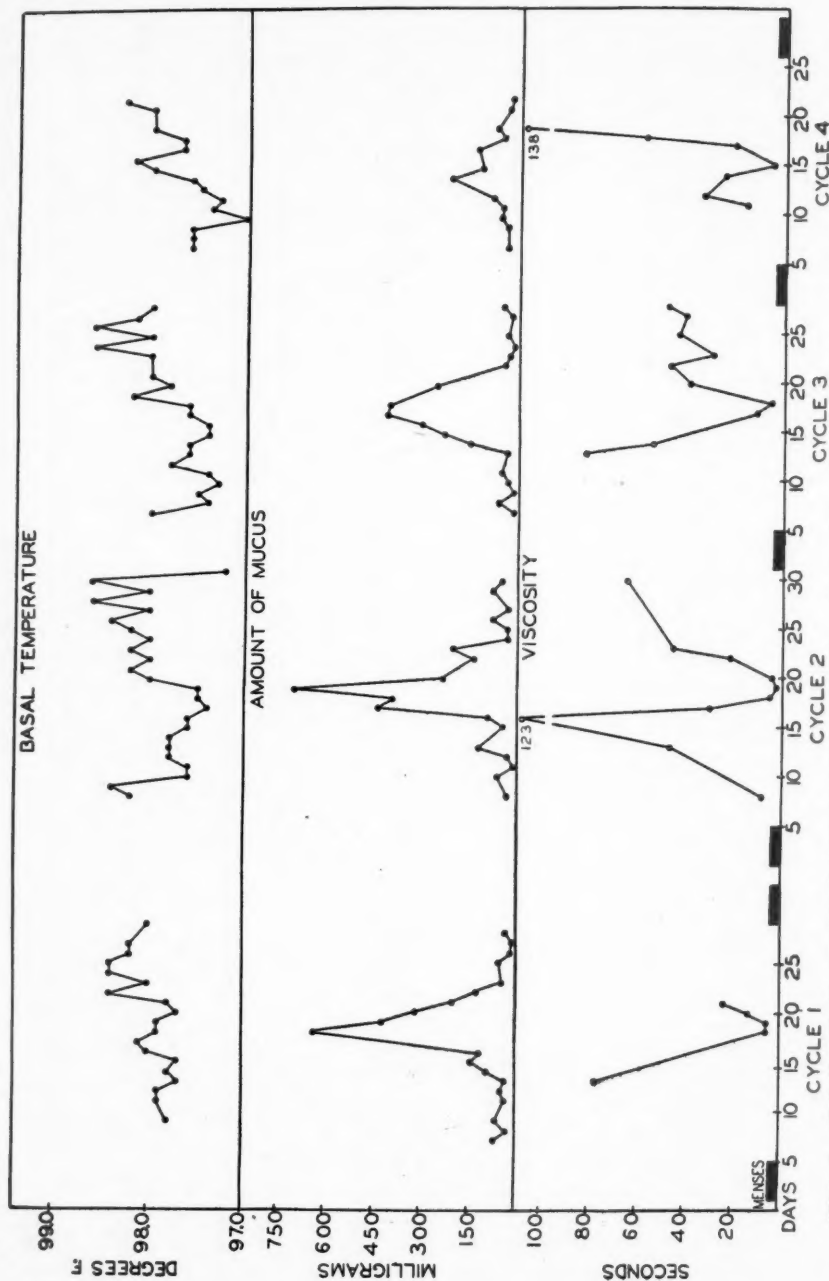


Fig. 5.—Relation between basal temperature, amount and viscosity of cervical mucus for Subject 8, a 24-year-old nullipara. Cycles 2, 3, and 4 were consecutive. Cycle 4 was not completed because of illness after the twenty-first day. Symbols as explained under Fig. 3.

do not compare in magnitude with the changes found during the ovulatory period, they are nevertheless apparent. The fact that standard conditions could not be set up controlling the temperature of the room, the amount of sleep, the diet, or the occurrence of mild infection, might explain these minor variations in the basal temperature. This does not greatly affect

the observed temperature shift in mid-cycle. The quantity of mucus in the cervical canal and about the external os may depend on the accumulation there, and this in turn may depend on posture, the upright position presumably favoring drainage, although this is conjectural. Whatever the cause of these minor fluctuations, the data certainly show marked differences in the amount obtainable in the various phases of the cycle, the peak production occurring at the time associated with ovulation. Daily fluctuations are also noted in the viscosity of the mucus. As has been stated previously, this material is by no means homogeneous. In addition to variation in the cellular content there is probably also considerable difference in the tackiness of the mucus. These changes in tackiness undoubtedly modify the readings as obtained with the apparatus used. Nevertheless, during the ovulatory period, the figures all show characteristic and distinct periods of low viscosity corresponding to the approximate time of the temperature shift and to the period when the amount of secretion reaches its height. Only relatively low pressure is required to measure the viscosity at this time.

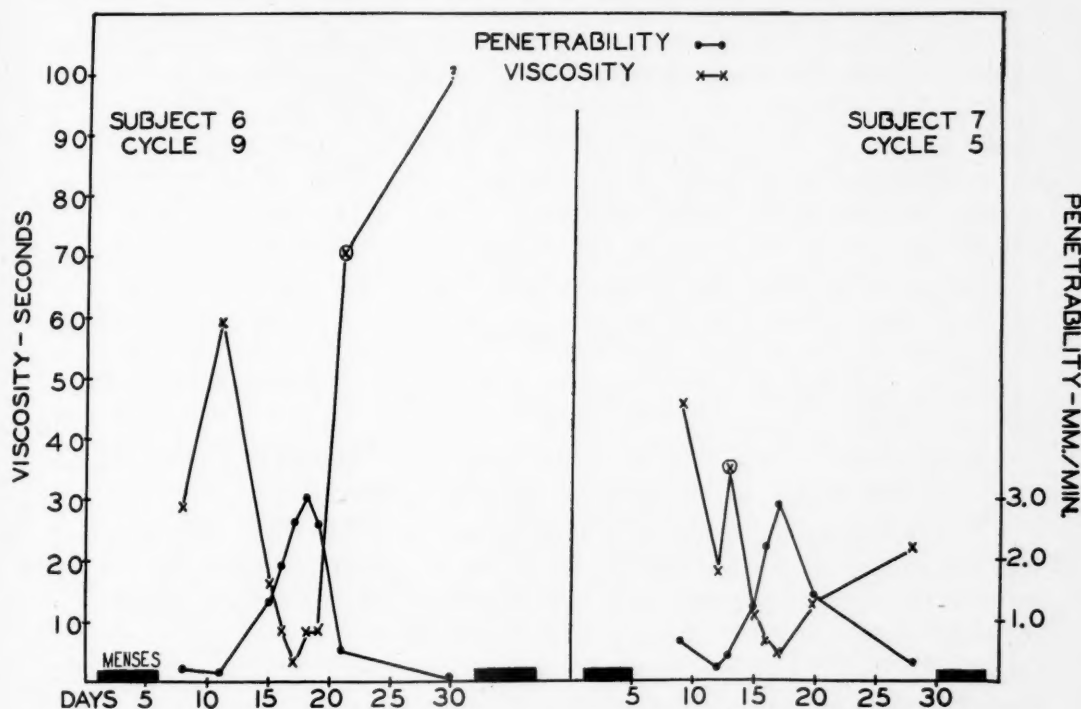


Fig. 6.—Relation between the viscosity and the penetrability of cervical mucus by spermatozoa.

The correlation between the viscosity and the penetrability of cervical mucus by spermatozoa was studied in two cycles and the results are shown in Fig. 6. It is apparent that the two are closely related, the maximum penetrability being associated with the minimum viscosity. Although this finding was to be expected in view of Lamar's work, it was the first comparison between the two when the viscosity was measured by an objective method. It is not known whether or not the viscosity is per se the factor which determines the degree of penetrability, but the above observations seem to suggest such an interrelationship.

Comment

It would appear from these studies that the ovulatory process in normal subjects has remote manifestations in that it is characterized by a period of increase in the secretion and a decrease in the viscosity of the cervical mucus, along with a shift in the basal temperature. Since these events occur during

the same short period of time, which presumably marks the time of ovulation, a study of these fluctuations might give information concerning the likely time of conception and might help explain certain cases of sterility.

The authors have studied two patients with otherwise unexplained sterility who showed atypical curves when compared with normals. In the first case the amount of mucus increased normally and the vaginal temperature curve suggested that ovulation was occurring. The viscosity, however, remained very high throughout the cycle, never being less than 25 seconds. Also the mucus never became transparent and always showed a high cellular content. The reason for this high viscosity is practically impossible to determine with present methods, but until it can be decreased at the proper time in the cycle, it is doubtful whether the spermatozoa could traverse the cervical canal.

In the other cases the cycles were slightly irregular. In two cycles the vaginal temperature curves resembled the anovulatory type in that there were no definite cyclical patterns, and neither was there any cyclic change in the amount of mucus. In a third cycle the amount of mucus increased in mid-cycle and the temperature curve showed a definite rise at this time. However, the temperature had fallen to the preovulatory level four days after the rise and remained at this low level for the rest of the cycle, making it appear that the corpus luteum did not persist as in the normal individual.

Summary

1. An objective method for measuring the viscosity of cervical mucus has been presented.
2. Cyclic variations in basal temperature, and amount and viscosity of cervical mucus have been observed in normal young women.
3. The viscosity is decreased during the period of increased secretion, both phenomena occurring at approximately mid-cycle. At this time a shift in the basal temperature occurs, this shift being useful for fixing the approximate time of ovulation.
4. The penetrability of cervical mucus by spermatozoa is correlated with viscosity. Maximum penetrability occurs when the viscosity is lowest.
5. The use of the methods outlined above may prove helpful in the study of sterility.

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TUBAL STERILIZATION

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DURING the last ten years at the Sloane Hospital for Women, we have performed 233 sterilizations by a variety of operations on the Fallopian tubes. In this communication, our indications, methods, and results will be reviewed and the literature will be partially surveyed in an effort to determine which of the many tubal operations advocated offers us a simple, safe, sure, and rapid method of permanently occluding the lumen of the tubes.

"Pregnancy has occurred after all methods of tubal sterilization. Hysterectomy and bilateral salpingoophorectomy are the only possible safeguards." This statement, made by Dr. John Polak,¹ in 1933, still holds good today.

Historical

The first attempt at tubal sterilization recorded in the literature appears to have been performed at Toledo, Ohio, in 1880, at the time of a cesarean section.^{2, 3} A ligature was placed about the tubes 1 inch from each cornua. Between 1880 and 1910, a variety of techniques were attempted with rather poor results. These included ligation, crushing, resection, or a combination of such procedures. Many failures were encountered by Ries, Fraenkel, and Aftergeld, both in animal experimentation and on humans, between 1898 and 1899.⁴⁻⁶ In 1913, Leonard⁷ reviewed the literature and commented on the high incidence of failure following all methods, including resection, cauterization, and total salpingectomy.

In 1919, Madlener⁸ introduced a well-known tubal sterilization, which achieved considerable popularity on the continent, especially in Germany. In this operation, a small knuckle of tube is crushed and a ligature of nonabsorbable suture material is placed across the devitalized area (Fig. 1). In 1921, J. Whitridge Williams² discussed sterilization in detail and reviewed 44 cases performed at the Johns Hopkins Hospital. He ventured to predict at this time that the Madlener method would not stand the test of time. In 1926, and again in 1932, Madlener^{9, 10} reported on two additional series of cases with no known failures. By this time, however, scattered reports of failure of this operation to prevent pregnancy began to appear in the literature.¹¹⁻¹⁴ Von Graff,¹⁵ reviewed the subject up to 1938. He collected 4,279 Madlener sterilizations with 19 known failures. His table is brought up to date with the addition of ten other reports (Table I).

At least one hundred other methods of tubal sterilizations have been described, including knotting of the tubes. The majority of these operations are minor variations on one or two basic themes. All have resulted in a variable number of failures.

Cornual resection, once considered foolproof, has not stood the test of time any better than other methods (Fig. 2). In this operation a wedge-shaped mass of tissue from the uterine cornu is excised along with the tubal isthmus. Numerous failures following this operation are encountered in the literature.^{9, 16-20} Nurnberger¹⁶ estimated the incidence of failure of cornual resection to be about 7.7 per cent. This high incidence is not surprising, inasmuch as pregnancy has developed after salpingectomy and supravaginal hysterectomy.²¹

A variety of segmental resections have been reported. Many of these operations include burial of one or both tubal stumps between the leaves of the broad ligaments. This type of operation is highly recommended by Watson, who has never had a failure (Fig. 3). However, there are reports in the literature of pregnancy following this type of sterilization.²²

TABLE I. REPORTED SERIES OF MADLENER STERILIZATIONS

AUTHOR AND YEAR	NUMBER OF CASES	NUMBER OF FAILURES	PER CENT
Von Graff ¹⁵ (Lit to 1938)	4,279	19	0.44
Neubauer ³³ 1938	83	2	2.4
Adair and Brown ³⁴ 1939	50	0	0
Lazard ³⁵ 1940	117	1	0.85
Dippel ³⁰ 1940	101	5	4.9
Hewitt and Whitley ³⁶ 1940	100	0	0
Brennecke ³⁷ 1941	23	0	0
Pfeutze ³⁸ 1941	165	3	1.9
Thornton ²⁶ 1941	3	0	0
Mays and Dilworth ³⁹ 1941	29	0	0
Lock ²⁷ 1942	2	0	0
TOTALS	4,952	30	0.6

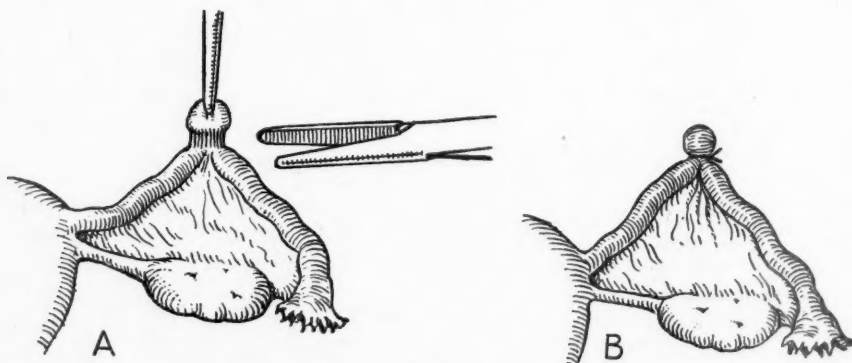


Fig. 1.—The Madlener sterilization.

In 1930, Bishop and Nelms²³ described a simple method of tubal sterilization which had been serving Dr. Ralph Pomeroy well for many years (Fig. 4). Pomeroy claimed no credit for originating this technique. The tube is grasped at its mobile middle third, thus forming a loop. This, with a small portion of mesosalpinx, is ligated without preliminary crushing with fine absorbable catgut. The segment of tube above the ligature is then excised. Bishop's original series consisted of 100 successful cases. From a perusal of the literature, it seems that this operation has not met with full recognition. Lull, in 1936,²⁴ and again in 1940,²⁵ reported on additional Pomeroy sterilizations bringing the total in the literature up to 812. All these cases were carefully followed. There were no known failures. In 1941, Thornton²⁶ reported 219 Pomeroy sterilizations and a high follow-up rate. Lock,²⁷ in 1942, reported on 57 additional cases. In Table II, these reports are itemized, including our 174 Pomeroy sterilizations. The incidence of failure for this procedure is half of that for the Madlener.

Indications, Methods, and Results

On the obstetric service at the Sloane Hospital for Women, between January, 1934, and January, 1944, 233 tubal sterilizations were performed. Of these,

174 or 75 per cent were Pomeroy resections, with one failure. Other procedures used included 42 cornual resections, comprising 18 per cent, with no failures, and 14 (7 per cent) segmental resections with or without burial of the stumps. There was one failure in this latter group. The two failures will be discussed later. All sterilizations were performed at the time of cesarean section, in conjunction with hysterotomy or as puerperal procedures.

During this ten-year period there were 612 cesarean sections. Of these, 102 were accompanied by tubal sterilizations, giving an incidence of 16.6 per cent. Seventeen and six-tenths per cent of these sterilizations were performed

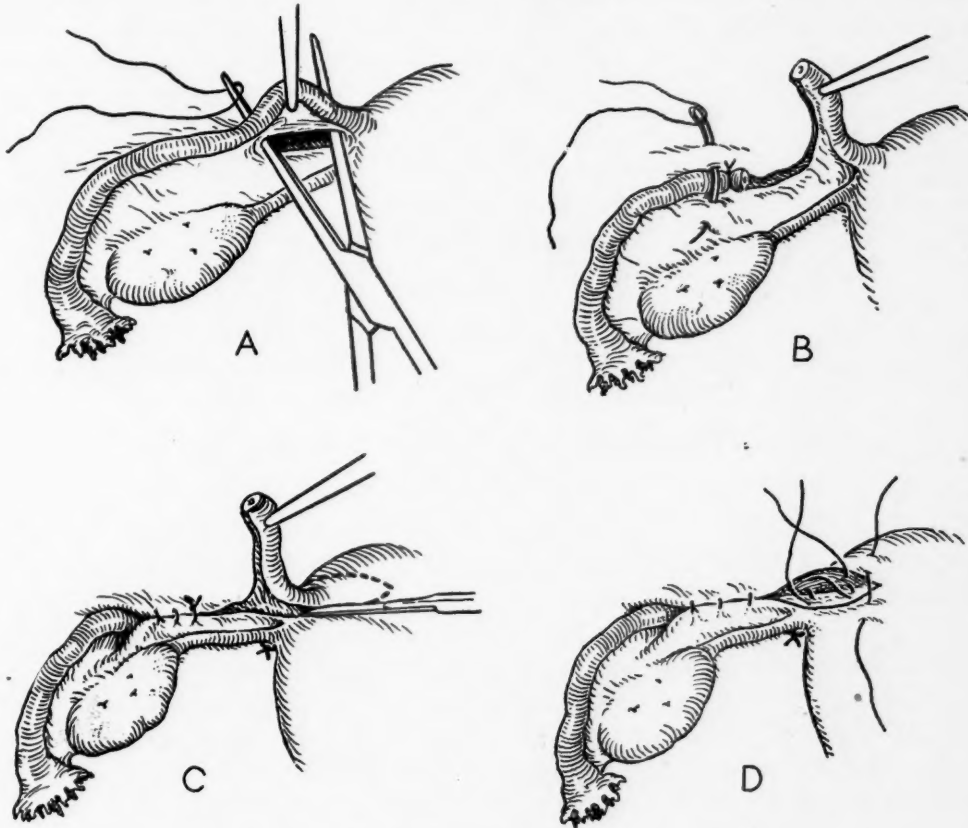


Fig. 2.—Cornual resection.

TABLE II.—REPORTED SERIES OF POMEROY STERILIZATIONS

AUTHOR AND DATE	NUMBER OF CASES	NUMBER OF FAILURES	PER CENT
Lull ²⁵	812	0	0
1940			
Thornton ²⁶	219	0	0
1941			
Lock ²⁷	57	2	3.5
1942			
Sloane	174	1	0.6
1944			
TOTALS	1,262	3	0.31

at the time of the first cesarean; 53.9 per cent at the time of the second cesarean, and 28.4 per cent at the time of the third cesarean. Based on an eight-year survey, our secondary cesareans are one-third as numerous as the primary sections, and tertiary sections are one-fourth as numerous as the secondary sections.

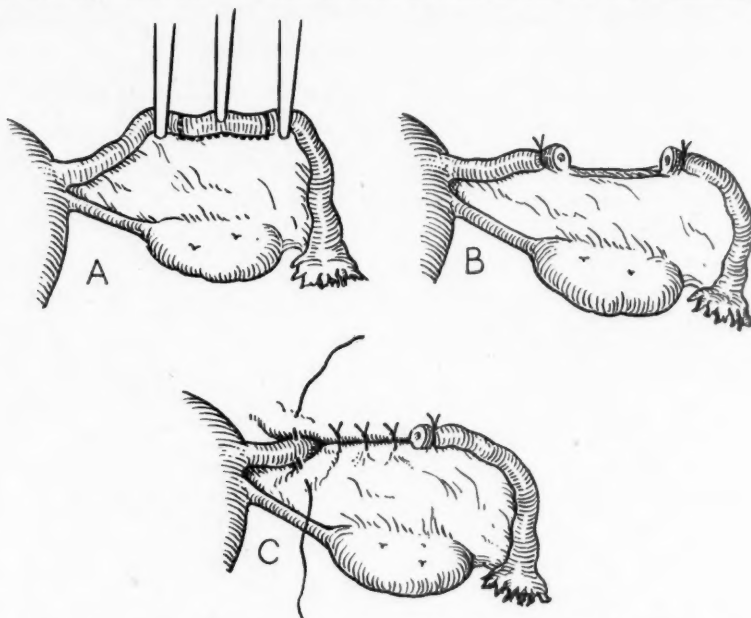


Fig. 3.—Segmental resection as performed by Dr. B. P. Watson.

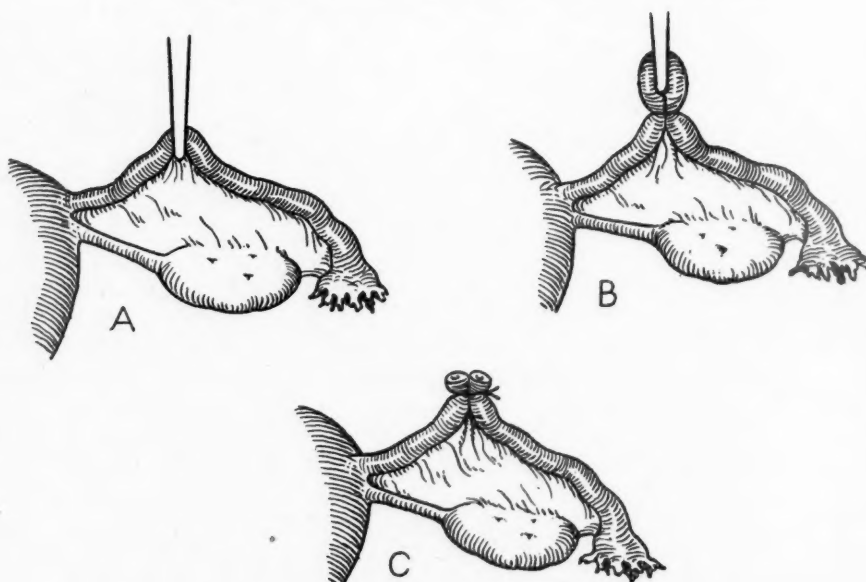


Fig. 4.—The Pomeroy sterilization.

Accordingly, we perform tubal sterilizations on approximately 6 per cent of our patients at the time of their first cesarean, 40 per cent at the time of their second cesarean, and 80 per cent at the time of the third section.

TABLE III. INDICATIONS FOR STERILIZATION AT PRIMARY CESAREAN SECTION

Rheumatic heart	3
Pre-eclamptic toxemia	2
Chronic glomerular nephritis	1
Previous vaginal plastic	2
Syphilitic aortitis	1
Chronic pulmonary tuberculosis	2
Intracranial tumor	1
Cicatrix of cervix	1
Psoas abscess	1
Multiparity (associated with one of above indications)	6

The indications for sterilization at the primary cesarean are shown in Table III. The indications for cesarean section were obstetric in each instance. The indications for sterilization were primarily medical. Several patients were multiparas (three or more living children), who required a section because of placenta previa.

The techniques used for sterilization in this group were as follows:

Pomeroy resection—(77.4 per cent)	79
Cornual resection—(13.7 per cent)	14
Segmental resection—(7.8 per cent)	8
Salpingectomy—(1 per cent)	1

One failure occurred in the group of segmental resections. This patient was a primipara with an asymmetrical pelvis and an active tuberculous hip. She became pregnant within six weeks after an uneventful postoperative course. At the secondary cesarean section the left tube appeared to be intact. There was superficial scarring in the isthmic region of the tube. The left ovary contained a corpus luteum. Only the distal portion of the right tube could be identified. A complete left salpingectomy and right cornual resection were performed.

Of these 102 patients, only 9 could not be followed. The average follow up for the entire group was 18.5 months apiece. There was no maternal mortality. Postoperative complications included one pulmonary embolus, one thrombophlebitis, and one wound infection.

During the same ten-year period, 97 abdominal hysterotomies and sterilizations were performed. All of these patients were young individuals with valid medical indications for both termination of their pregnancies and sterilization. All patients were at least three months pregnant and therefore were not considered suitable candidates for dilatation and curettage. In each instance it seemed desirable to preserve the menstrual function. The indications are itemized in Table IV. About 50 per cent of these patients were multiparas (three or more living children). There were no known failures. Four patients could not be followed. The average follow-up for the entire group was 29.5 months per patient.

There was one maternal death. This patient had an intracranial tumor. She died on her fourth postoperative day from peritonitis and abscess of the uterine incision.

The types of operation used in this group were as follows:

Pomeroy resections—(65 per cent)	63
Cornual resections—(28.7 per cent)	28
Segmental resections—(6.3 per cent)	6

TABLE IV. INDICATIONS FOR ABDOMINAL HYSTERECTOMY AND STERILIZATION

Rheumatic heart disease	28
Psychoses	9
Chronic glomerular nephritis	6
Active pulmonary tuberculosis	5
Diabetes mellitus	4
Hypertensive cardiovascular disease	8
Recurrent eclampsia	5
Hyperthyroidism	2
Familial insanity	1
Syphilitic aortitis	1
Syringomyelia	1
Chronic encephalitis	2
Recurrent hyperemesis	1
Tertiary syphilis	1
Essential hypertension	2
Ventricular extrasystoles	1
Aneurysm of aorta, syphilitic	1
Epilepsy	3
Chronic pyelonephritis	4
Lymphoma of nasopharynx	1
Carcinoma of thyroid	1
Brain tumor	3
Hypothyroidism	2
Moron	1
Hydronephrosis	1
Multiple sclerosis	2
Carcinoma of breast	1
Bilateral ureteral strictures	1
Thrombophlebitis	1
Bronchiectasis	1
Splenomegaly	1
Multiparity	45

A small group of 34 postpartum sterilizations were performed. The Pomeroy resection was used exclusively. There was one failure. This patient was a rheumatic cardiac who was sterilized after the birth of her third child. She returned pregnant nine months after discharge. A complete abdominal hysterectomy was performed. At laparotomy, the right tube appeared to be intact. The isthmical portion was slightly scarred. There was a gap in the left tube at its middle third, approximately 2 cm. in length.

Discussion

Any procedure designed to prevent conception in a woman in the child-bearing age must not be considered casually. The prevalent attitude toward such procedures at the Sloane Hospital for Women has been well stated by Watson.²⁸ The indications for such operations need no further comment.

There are few figures quoted in the literature which offer a basis for comparison with ours in terms of the incidence of sterilizing operations on obstetric patients. Lull's²⁴ statistics are quite comparable to ours.

Lull's Nine-Year Survey

14,039 obstetric patients
Total number sterilized, 223 (1.3 per cent)
Sterilized at cesarean, 111
Sterilized at hysterotomy, 19

Sloane's Ten-Year Survey

16,266 obstetric patients
Total number sterilized, 233 (1.4 per cent)
Sterilized at cesarean, 102
Sterilized at hysterotomy, 97

In terms of viable births we sterilize 0.83 per cent of our obstetric patients.

Four techniques for tubal sterilization have been described. Practically every method of tubal sterilization described in the literature is based on one of these operations, with one or more minor individual variations. The fact that there are so many variations reported indicates that none has been entirely successful. Undoubtedly an important cause of failure in many of the reported cases was faulty surgical technique. This was unquestionably the cause of failure in our two cases. In each instance, the resection was apparently performed at the rather fixed isthmic portion of the tube and evidently only a tiny fragment of tube was excised. Apparently in both cases the divided ends of the tubes readily adhered to one another and rapidly recanalized after absorption of the ligature. However, after studying these different operations and the causes of failure in each, certain biologic and mechanical factors are encountered which indicate inherent weakness in many of these procedures. Rubovits and Kobak,²⁹ and Dippel³⁰ have had the opportunity of making serial sectioning of tubes of individuals on whom the Madlener sterilization had been performed unsuccessfully. These authors clearly demonstrated the occurrence of the biologic phenomenon which Sampson called endosalpingiosis. Sampson studied by serial section both the tubes and cornual regions of uteri of individuals who had been subjected to tubal sterilizations and total salpingectomies. He demonstrated the great propensity of tubal epithelium to regenerate and recanalize adjacent fiber-muscular tissue following injury. Of 147 cases studied, only 35 showed evidence of normal tubal healing. Rubovits and Kobak,²⁹ and Dippel³⁰ have demonstrated the presence of tuboperitoneal fistulas and canalization of the mesosalpinx following the Madlener operation. The mechanical factors concerned in the carefully studied failures seem to be related to the use of nonabsorbable suture material which is notorious for its ability to cut through both devitalized and normal tissue. It appears, then, that the Madlener operation may be justly criticized as unsound from both the mechanical and biologic aspects. A survey of the literature reveals a relatively high incidence of failure of this operation to fulfill its purpose. The high incidence of failure for this technique may be demonstrated by lipiodol studies as suggested by Rubovits and Kobak,²⁹ and Lull.²⁴

Cornual resection does not seem to be as popular today as it was ten years ago. This operation is an elaborate procedure requiring more operating time and very careful approximation of tissues. It is a notoriously bloody operation. The failures of this procedure, apparently, have been due to small hematomas and foreign body reactions resulting in one or more fistulas communicating with the peritoneal cavity and lined by tubal epithelium. At Sloane we have completely discarded this operation.

Burial of one or both tubal stumps following a segmental resection has not been found to be foolproof. Sampson³¹ believes that this refinement increases the blood supply to the injured tubal epithelium and thus abets the rapid regeneration of the tubal epithelium with the formation of fistulas.

An analysis of the Pomeroy operation indicated that it avoids these various pitfalls. From the *most mobile portion* of the tube, a segment about 1½ to 2 inches is excised after ligation with fine absorbable suture material. No crush-

ing is employed. The tiny fragments of tube, distal to the ligature following excision, become necrotic and absorbed. Just beneath the ligature each end of the tube becomes sealed off by peritoneum, inasmuch as the muscular wall retracts slightly. Following absorption of the ligature, the two ends of the tube retract for a distance of 2 to 3 inches. Thus the continuity of the tube is completely interrupted. The drawing in Fig. 5 was made from an autopsy specimen of one of our patients who died three months after an abdominal hysterotomy and Pomeroy sterilization for subacute bacterial endocarditis. Lull²⁵ and Goldblatt³² have had the opportunity of observing the end result of this operation at subsequent laparotomies and describe the same findings. Unfortunately our specimen did not yield microscopic sections of sufficiently good quality for microphotographs because of faulty fixation.

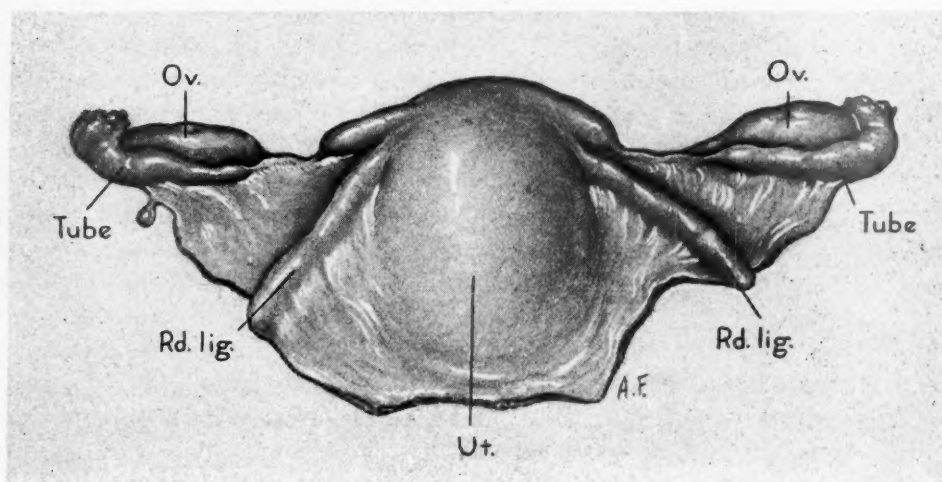


Fig. 5.—Drawing of autopsy specimen three months following Pomeroy sterilization. Note the wide retraction of the ends of the tubes and completely peritonealized surfaces.

How long a patient should be followed after a tubal sterilization is difficult to state. The majority of failures become manifest within three to six months after the original procedure. However, a latent period for as long as ten years has been recorded in the German literature. Of interest, also, is the possibility of development of a tubal pregnancy. The majority of such complications reported appear to have followed the Madlener operation.

Summary

Two hundred and thirty-three tubal sterilizations performed during a ten-year period have been reviewed.

The literature pertaining to tubal sterilizations has been reviewed in an effort to determine which type of operation offers the highest incidence of success.

Conclusions

1. The Pomeroy sterilization is a safe, simple, sure, and rapid procedure.
2. The reported failures of this operation are 50 per cent fewer than for the Madlener sterilization.

3. The Pomeroy sterilization avoids mechanical and biologic hazards to success, inherent in other types of tubal sterilization.

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EARLY CONTROLLED AMBULATION IN THE PUERPERIUM*

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THE period for ambulation of obstetric patients for many years has aroused considerable differences of opinion.

White of Manchester, England, 1728-1813, stated "as soon as the patient gets out of bed the better and this should not be deferred beyond the second or third day at the furthest."¹

In 1820, Gooch cautioned that patients should be kept in bed for three weeks after delivery because of the danger of prolapse of the uterus. Between this era of obstetrics and the present era, the period of ambulation has varied from one extreme to the other. It is the purpose of this treatise to record the gross data of a large group of patients under controlled ambulation and a detailed report of a smaller group of private patients, to show that the advantages of controlled ambulation may be obtained without incurring any of the disadvantages in the puerperal woman.

Repeated experience with the difficulty of keeping in bed throughout the early puerperium large numbers of Negro patients delivered at home first called our attention to the possibility of early controlled ambulation in obstetrics. This experience was further accentuated when construction of new facilities reduced the bed capacity of the obstetric service of Charity Hospital of New Orleans for a period of two years. Because of this fact it became necessary to send patients home by the fifth day and to allow them freedom of controlled ambulation. Observation at the six weeks' examination of these patients revealed no apparent differences in abnormalities as contrasted with the previous years when the patients had been maintained at absolute bed rest with exercise.

In 1940, with this experience as a background, a system of early discharge of the puerperal patient from the third to fifth day under controlled ambulation was instituted. There was a careful daily follow-up in the homes by the nursing service of the Maternal and Child Health Division of the City Board of Health of New Orleans. The initial survey of 2,926 of these patients revealed the fact that only 30 developed immediate puerperal complications.² These were in the nature of two cases of endometritis, two of mild pyelonephritis, and twenty-six with engorgement of the breast and/or fissured or cracked nipples.

Postpartum examination of these patients at six weeks revealed that the general recovery rate was better in comparison to those cases that remained nonambulatory in the hospital. Relaxations and/or uterine prolapse, malpositions of the uterus, and subinvolution of the uterus were present in a smaller number than in nonambulatory cases.

A further detailed study of 323 private cases was undertaken in order to assay the advantages or disadvantages in a class of patients usually seen in private practice. These patients are not as hearty individuals as most of the patients seen in teaching institutions even though they are probably in a better state of general health.

*Presented before the Scientific Faculty of Southwestern Medical College.

Method of Ambulation

The criterion for allowing ambulation is that the patients are medically in a condition to be allowed this privilege.

The patient is advised to move freely in bed immediately upon recovery from whatever type of anesthesia may have been given. Every eight hours for the first twenty-four hours following delivery she is asked to sit up on the side of the bed for a few minutes, to cough vigorously to clear the respiratory system of any mucus and to stimulate the circulation in lower extremities. At each voiding the patient sits upright on the bedpan. On the second day the patient stands upright on four different occasions for a few minutes, followed by sitting upright in the chair for a period of fifteen to twenty minutes. Voiding is accomplished while sitting on the bedpan placed on a chair. On the third day ambulation about the room for short periods of time on three or four different occasions is permitted. Complete bathroom privileges are granted. Thereafter, controlled ambulation is permitted with the restriction that each hour of ambulation be terminated by an hour of bed rest. By the tenth day the patient is completely ambulatory, requiring only intermittent periods of rest. At the end of the twenty-first day the patient is allowed to resume complete outdoor ambulation without unduly tiring herself.

Clinical Material

There were 227 primigravida cases and 96 multigravida, the latter varying from gravida ii to vii. The duration of labor in the primipara averaged 12 hours, 32 minutes; and the multipara, 7 hours, 18 minutes. There were 318 vertex and 5 breech presentations. Labor was terminated in 285 instances by the application of outlet forceps, in 7 instances by the application of midforceps, and in 5 instances by the use of Piper forceps for the aftercoming head following 3 spontaneous breech deliveries, and 2 breech deliveries by manual aid. Twenty-six cases delivered spontaneously.

Sedation of varying degrees was employed in all cases using nembutal and scopolamine. Delivery was accomplished in 103 cases under caudal analgesia; 30 cases under local pudendal block; and 190 cases with gas anesthesia. Left mediolateral episiotomies were performed in 290 cases and repair accomplished using chromic 000 interrupted sutures. Twenty cases were delivered without episiotomies. In three of these, first-degree lacerations occurred.

The third stage of labor was managed by the administration of ergonovine, $\frac{1}{320}$ grain, intravenously, with delivery of the anterior shoulder in other than caudal analgesia cases. In the latter it was given after delivery of the placenta. In three instances more than average bleeding occurred at this period.

Results

Immediate Puerperium (Two Weeks)

General.—In all instances patients expressed the opinion that a general feeling of well-being occurred from the ambulation. This was particularly true in the multigravida who felt that recovery was hastened by ambulation in comparison to their previous puerperium.

Lochia.—There was the greatest drainage of lochia in the first three to five days with a rapid decrease in the amount until almost complete cessation by the tenth day when the lochia was completely serous.

Bladder and Bowel.—In not a single instance was catheterization necessary. Bowel function was normal without the use of enemas or cathartics. It was noted that the patients complained less of hemorrhoids than had been observed previously in nonambulatory patients.

Uterus.—In all but six instances involution of the uterus was accelerated, and the fundus by the seventh day was palpable between the symphysis and two fingerbreadths above it. By the tenth day the uterus was no longer palpable, being in the pelvis. The six cases which underwent slower involution exhibited a palpable uterus at the symphysis between the tenth and twelfth days, it being in the pelvis by the fifteenth day.

Episiotomy.—Complete healing was present by the seventh day in all except two instances in which dehiscence of a moderate degree was present, so that healing occurred by secondary intention in these two cases by the twelfth day. There was a notable lack of complaint about episiotomy pain after the first day of ambulation.

Morbidity.—In ten cases morbidity was present for an average of three days. Etiology of such morbidity was pyelonephritis in two cases, endometritis in three, and mastitis in five cases.

Postpartum Bleeding.—In six cases bleeding was exaggerated enough to require a short course of oxytocics. There was present no immediate severe bleeding.

Pulmonary and Vascular Complications.—None were present.

Delayed Puerperium (Six Weeks)

General.—All patients when questioned had been completely ambulatory from the twenty-first postpartum day without any evidence of general fatigue but with a state of well-being.

Uterus.—Subinvolution was present in four cases to the extent that the uterus was twice its normal size at this period. Retroposition of the uterus was present in sixteen instances. There was an absence of relaxation of the anterior and posterior vaginal walls and of uterine prolapse at this time.

Pulmonary and Vascular Complications.—None were present.

Delayed Puerperium (Six Months)

One hundred fifteen of the above patients were re-examined at this period. The patients again reiterated their satisfaction for their rapid return to normalcy without any discomfort to them. There was an absence of any additional abnormality as compared with the six weeks examination. Particular reference to the possibility of relaxation and/or prolapse revealed nothing of note.

Discussion

In advocating early controlled ambulation during the puerperium one should be cognizant of its potential advantages and disadvantages.

The potential disadvantages expected (postpartum hemorrhage, excessive relaxation and/or uterine prolapse, and dehiscence of episiotomy) were less in these series than in previous series of nonambulatory patients. True, complete elimination of prolapse and/or relaxation as a complication requires a longer follow-up than in these series. However, if deliveries are accomplished in a manner to avoid injury of the fascia propria, there should be no increase in relaxation and/or prolapse. When injury to the fascia propria has occurred, it is not conceivable that bed rest produces a return of fascial support. In the past the obstetric patient has remained nonambulatory for long periods of time, yet large numbers of cystocele, rectocele, and uterine prolapse are seen in gynecologic clinics.

The advantages obtained from controlled ambulation of these two series were beyond any expectation. There was a complete absence of bladder and bowel disturbances, phlebothrombosis and thrombophlebitis, with a marked reduction in uterine subinvolution and retropositions. The obtaining of these advantages without the appearances of the expected disadvantages makes one realize that controlled ambulation has much to offer the obstetric patient.

Conclusions

A gross report of 2,926 cases and a detailed report of 323 cases who experienced early controlled ambulation is given. Early controlled ambulation is shown to offer advantages to the obstetric patient without imposing any disadvantages.

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THE ANESTHETIC MANAGEMENT OF PATIENTS WITH RESPIRATORY PARALYSIS REQUIRING LAPAROTOMY

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IN A COMPANION publication,¹ the obstetric and surgical management of a patient who underwent laparotomy for cesarean section is reported. The special interest in the case was the complicating acute anterior poliomyelitis which had produced complete paralysis of the respiratory muscles. The present discussion considers the anesthetic management of the same patient. During operations under similar circumstances which have been reported, local anesthesia was utilized while artificial respiration was employed.^{2, 3} In one instance, the baby survived six hours and in the other, the mother lived two days. Anesthesia was reported as satisfactory.

The pregnancy of the 27-year-old subject of this report was further complicated by breech presentation, pyelonephritis, and acute glomerulonephritis. The patient had overflow incontinence and was unable to defecate. All voluntary motor function of spinal innervation was lost except a very limited motion of the right hand. The cough reflex was absent and there was some facial paralysis. Any passive movement caused severe pain. Anesthesia was complicated further by prematurity (thirty-five weeks' gestation).

Selection of Agent

The anesthetic gases, the volatile agents, the intravenous drugs and the local or regional agents of current popularity have given satisfactory results when competently administered during cesarean section. The absolute contraindications to the use of any of these agents for the subject of this report were few. The existing nephropathy was considered a logical reason for avoiding ether or chloroform and to a lesser extent the intravenous barbiturates. The desire to minimize postanesthetic nausea and emesis, which may be a serious complication for a respirator patient without a cough reflex, added further reasons for not employing volatile agents. The choice of the agent was then limited to the gases, the intravenous and the local agents. Consideration was given to the one of these that could be adapted most conveniently to the technique required. Artificial respiration was essential during the entire period that the patient was to be outside the respirator. Although this could be accomplished conveniently by the anesthetist with comfort for the patient, it was thought inadvisable to prolong it for any reason, particularly if the patient was to remain conscious. Since the techniques with local infiltration, regional nerve block (caudal), and spinal anesthesia required more time, they seemed less desirable. A further factor in not choosing one of them was the intense pain caused by any passive motion.

Although the amount of an intravenous drug such as pentothal sodium would probably have been small for a relatively short procedure to be completed for a patient with paralyzed musculature, an evaluation of the effects of this drug on the fetus is still a subject of controversy. Furthermore, the drug is detoxified and eliminated by the body and the physical condition of this patient opposed any additional burden of detoxification and elimination of drugs. In addition, the undesirable necessity of dividing the responsibility of artificial respiration and anesthesia when intravenous injections are employed, inclined us to favor inhalation anesthesia.

Nitrous oxide, ethylene, and cyclopropane have many advantages in obstetric surgery. The less potent agents, nitrous oxide and ethylene, have been declared dangerous frequently because of the low oxygen concentrations used when they are administered. The justification of this criticism lies not in the agents but in the faulty technique usually employed. To use these gases safely during laparotomy for an unpremedicated patient, even though relaxation is not a consideration, requires an exacting, deliberate technique. When continuous artificial respiration is a primary essential, the procedure may become more complicated and multiply the chances of technical errors. Because cyclopropane is more potent, the danger of low maternal or fetal oxygen saturation is diminished. It may, however, influence the incidence of asphyxia neonatorum. When its administration is prolonged or profound narcosis is produced, the respiratory function of the infant may be somewhat depressed. The rapidity with which light surgical anesthesia is produced permits prompt surgery and, when delivery can be accomplished within a few minutes (12 to 15), the concentration of the gas in the fetal circulation is negligible and ineffective.⁴ Since the convenience of cyclopropane administered during continuous artificial respiration is not surpassed by any other agent given by inhalation, it was the optimum choice.

Anesthetic Technique

Although the techniques for modern anesthesia may seem complicated, most of the procedures are performed without serious risk. The present development of surgery has required the addition of more elaborate appliances and a more versatile approach to the problems presented. The anesthetist has long since accepted the responsibility of assuming certain functions of the anesthetized patient. He confidently expects to control the patient's breathing during many surgical manipulations. When this is necessary throughout the procedure because of respiratory paralysis, no serious obstacle to safe, convenient anesthesia is added. Controlled respiration is more easily performed when a functioning airway is assured with an endotracheal catheter in place. Such airways may be inserted with only slight discomfort to a conscious patient if the upper air passages and the proximal area of the trachea are anesthetized by spraying a suitable anesthetic solution through the nares and mouth. Airways may be placed, then, either through the nostril, blindly, or with slight discomfort by direct vision with a laryngoscope. Endotracheal airways may be inserted conveniently after anesthesia has been induced. If surgical anesthesia is to be

continued, there is no need to anesthetize the upper air passages with local anesthetic solutions.

Controlled respiration in the anesthetized patient is performed simply and satisfactorily by using a well-fitted face mask and a rebreathing bag with a carbon dioxide absorbing unit in the system or a properly adjusted exhalation valve. Pressure, sufficient to hyperventilate the lungs modestly, is then applied to the breathing bag during the inspiratory phase of respiration. Tissue carbon dioxide is thereby reduced and, after a variable time, the amount will be insufficient to reach the threshold of a respiratory center depressed by anesthesia. This may be continued as desired.

Conduct of the Case

The patient was fully aware of an impending operation of dramatic and uncommon seriousness. She was entirely cooperative although, naturally, apprehensive. It was extremely important that those who were to treat her, particularly until she was asleep, should have her confidence; therefore, visits were made before the day of operation, the procedure discussed, and a friendly and reassuring environment established. She was removed from the respirator for short periods on several occasions to demonstrate to her that she was safe and comfortable when the resuscitator* was used.

Preanesthetic medication was not given, in order to avoid any effects upon the fetus. The initial procedure was the anesthetization of the upper air passages with an aqueous solution of cocaine (2 per cent). This was applied with a common atomizer by spraying in each nostril and over the root of the tongue as the respirator produced the inspiratory phase of respiration. After ten minutes, endotracheal intubation was attempted with a soft rubber airway directed blindly through a nostril. The attempt was soon abandoned since the head could not be adjusted without releasing the respirator attachments about the neck. The patient was then given cyclopropane-oxygen anesthesia for two minutes and a spring-wire latex-covered airway was introduced under direct vision with a laryngoscope. Anesthesia was not continued. The patient recovered at once and was pleased that she now had experienced going to sleep and awakening from cyclopropane. With the resuscitator adjusted, the patient was transported to the operating table and put in position. Asepsis was applied, drapes put in place, and the surgeons made ready to operate. The resuscitator was then discontinued and a mask and bag were utilized to supply the cyclopropane-oxygen mixture as respirations were manually controlled. The stage of surgical anesthesia was obtained within three minutes and was maintained in light first plane throughout the operation*. The baby was delivered four minutes after surgery had been started. It cried lustily and spontaneously a few seconds after removal from the uterus. The operation was completed in twenty-five minutes, at which time anesthesia was discontinued, and the resuscitator put into use again. The patient was fully awake and rational four minutes after anesthesia had been discontinued.

*An adult model Kreiselman resuscitator.

During the procedure, there were minute-to-minute determinations of the pulse rate and blood pressure. The latter varied from 180/140 to 110/90, being 160/90 at the start and 150/90 when anesthesia was concluded. The pulse rate was 110 at the beginning of induction and remained rapid throughout. It was noted with interest that the pressure required to inflate the lungs became markedly reduced after the baby was delivered.

Discussion

The refinements of modern anesthesia have armed the anesthetist with many means to minimize the danger and discomfort to the patient and provide reasonable convenience for the surgeon during any manipulation justifiably indicated. There are minor differences among anesthetists in evaluating drugs and techniques, and individual preferences are not uncommon. All are agreed, however, that if gross errors in judgment are excluded, the success of anesthetic procedures depends to no small extent on the technical proficiency exercised. Those entrusted with the anesthetic management of the subject of this report were familiar and experienced with the drug and the method. There was complete confidence in its success and there was no incident during the procedure to indicate that such confidence was unjustified. A similar method would be employed if we should encounter another patient presenting the same problems. Unless another condition is present as a contraindication to the use of cyclopropane, the method seems to be applicable whenever laparotomy needs to be performed for a patient with respiratory paralysis.

Summary

The anesthetic management of a patient with acute anterior poliomyelitis and respiratory paralysis who required cesarean section is described.

Cyclopropane-oxygen was given by a mask and rebreathing bag which also served as a vehicle for continuous controlled respiration by manual pressure on the bag. An endotracheal airway was utilized.

Anesthesia was uneventful and the results entirely satisfactory.

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477 FIRST AVENUE
755 OCEAN AVENUE

PREGNANCY IN CASES OF PITUITARY DWARFISM

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THE pregnant dwarf is an obstetric problem which has received insufficient attention. Publications which have appeared have evidently been written with the idea of presenting an obstetric curiosity. This is unfortunate, for these people seem to be quite capable of becoming pregnant without difficulty. They present three very definite problems: The first is the consideration of the heredity of the physical abnormality and whether pregnancy should be advised or discouraged. The second is the character of the antepartum course. The third is the management of the labor. There are also the psychological complications which may arise from mother-child relationships, but these will not be discussed here.

A partial review of the available literature from 1901 to 1942 was made and is summarized in Table I, where the authors, with their cases, appear in chronological order.

In order to answer the first problem, it is necessary to divide dwarfs into two major types: the true dwarf and the achondroplastic dwarf. From the cases reviewed, it appears that the true dwarf was invariably the offspring of normal parents and in all cases gave birth to normal offspring. In the series of cases analyzed, there were three instances of true dwarfs^{4, 9, 10} and the offspring of each was found to be normal regardless of whether or not both parents were dwarfs. In only one case¹⁰ was the physical status of the father noted, and he also was a true dwarf. In addition to these, Gould and Pyle¹⁵ cite several other cases, and in each, the offspring was normal. They report that in 1742 Robert Skinner and his wife, both midgets, produced fourteen normal children, and in 1739, Joseph Browilaski, a midget, and his normal wife produced two normal children.

The achondroplasties, however, present a far different picture. Although an achondroplastic may be born of normal parents, the offspring of achondroplasties are very often born with the same affliction. In the series of cases presented, there were 15 achondroplastic mothers who bore 8, or 53.5 per cent, achondroplastic babies. It is apparent, then, that there must be an hereditary factor in achondroplasia which is lacking in the pituitary dwarf. Therefore, achondroplasties should be so advised when they seek premarital or obstetric advice.

As far as the antepartum course of either type of dwarf is concerned, there was very little to learn from their case histories to suggest that they fared any differently than other women. There may be psychological difficulties as were encountered in the case to be reported; for, although this patient was accustomed to the curiosity of the world about her, she had to be protected from the realization that, in her pregnant state, this curiosity would become unbearable. Since, in all cases, the pelvis were markedly contracted, an elective cesarean section was performed in each case. Thus, the management of labor will give rise to few complications if elective cesarean sections are performed.

TABLE I

AUTHOR	YEAR	TYPE OF DWARFISM	PELVIMETRY					
			DIAG. CONJ.	INTER-SPINAL	INTER-CRISTAL	INTER-TROCH.	EXT. CONJ.	X-RAY
MacLean ¹	1903	Achondroplasia	2.5 in.	6.8 in.	8.0 in.		6.4 in.	
Cutler ²	1904	Quest. rachitic	7.5 cm.	19.0 cm.	23.0 cm.	28.0 cm.	16.0 cm.	
Lepage ³	1904	Achondroplasia	5.7 cm.	21.0 cm.	24.0 cm.		17.0 cm.	
Porak		Achondroplasia						
Baldwin		Achondroplasia						
Potocki	1893	Achondroplasia						
	1894	(same patient)						
	-	5th pregnancy						
Fabre ⁴	1906	Pituitary dwarf	7.0 cm.	23.0 cm.	25.0 cm.			
Hirigoyen ⁵	1907	Achondroplasia		17.0 cm.	20.0 cm.			
Risso ⁶	1909	Achondroplasia	4.5 cm.	17.0 cm.	18.5 cm.	12.0 cm.	8.0 cm.	
Fieux ⁷	1914	Achondroplasia	8.0 cm.	21.0 cm.	20.0 cm.		16.0 cm.	
Clarke and Koenig ⁸	1923	Achondroplasia	6.0 cm.	21.0 cm.	23.0 cm.	31.5 cm.	17.0 cm.	
McClaran ⁹	1924	Pituitary dwarf						
Mason and Turner ¹⁰	1928	Pituitary dwarf						
Young ¹¹	1934	Achondroplasia						
Balasquide ¹²	1935	Achondroplasia	6.4 cm.	18.0 cm.	20.0 cm.	21.5 cm.	17.0 cm.	Flat and deformed
Lemaire ¹³								
Mother	1892	Achondroplasia						
	1894							
	1905							
	1906							
	1910							
Daughter*	1934	Achondroplasia						Flat
Spaling ¹⁴	1942	Achondroplasia	7.5 cm.	22.0 cm.	21.0 cm.	34.0 cm.	14.0 cm.	
		Achondroplasia	9.5 cm.	22.0 cm.	23.0 cm.	31.0 cm.	17.0 cm.	

*Daughter one of the five children noted above.

The case to be reported is that of M. N., a 41-year-old primigravid white pituitary dwarf, single, who presented herself for the first time at Bellevue Hospital on March 20, 1944. The patient's parents were both normal. Her father was 6 feet, 1½ inches tall, and her mother was 5 feet, 2 inches tall and weighed over 200 pounds. Her mother had eleven children: eight, including the patient, by a first marriage, and three by a second marriage. All siblings were normal, one brother being over 6 feet tall. There was no history of dwarfism anywhere in the family. The patient did not know when she first started to walk or talk, but believed these events occurred at normal times. She stated that she stopped growing at the age of four years. She went through the second grade of school at the age of 10 years and then "joined the show world."

She first started to menstruate at the age of 18 years and had a period every month lasting for four to five days, using 4 pads daily. There was no dysmenorrhea. After 1936, her periods began to occur every two months. Her last menstrual period was thought to have occurred on June 2, 1943. The date of conception was not known. The putative father was 29 years of age and normal in size. Nothing else could be learned about this man.

When the patient was first seen, she was complaining of abdominal pain. She was admitted to the gynecologic service where the diagnosis of intrauterine gestation was made and confirmed by x-ray. Shortly after, the patient was discharged and referred to the prenatal

TABLE I

X-RAY	TYPE OF DELIVERY	RESULT OF BABY	REMARKS
	Elective cesarean section at term. Sterilized	6¼ lb. normal male child	Patient's family normal
	Cesarean section after onset of labor	Normal male child	Sister mentally retarded and an idiot cousin
	Classical cesarean section 3 weeks before term	Achon. female, 2,550 Gm.	Patient's family normal
	Cesarean section	Achondroplastic	Normal husband
	Cesarean section	Achondroplastic	Normal husband
	Cesarean section	Achon. female	Normal husband. Patient died from peritonitis following 5th pregnancy
	Cesarean section	Achon. male	
	Cesarean section	Normal female	
	Cesarean section after onset of labor	Normal baby	Patient's family normal
	Classical section after onset of labor	Normal female, 2,850 Gm.	Patient's family and husband normal
	Elective cesarean section	Normal premature infant	Patient's family normal
	Elective classical section	Normal male, 3,300 Gm.	
	Cesarean section after onset of labor	Achon. male, 7 lb.	Patient's family normal
	Cesarean section after onset of labor	Normal male, 7½ lb.	Patient's family normal
	Cesarean section after onset of labor	Normal baby, 7 lb.	Patient's family normal, husband—pituitary dwarf
	Elective cesarean section	Unknown	
	Cesarean section after onset of labor	Normal male, 5¼ lb.	Patient's family and husband normal
	Classical cesarean section	Normal baby	Baby died at 2 mo.
	Classical cesarean section	Unknown	
	Classical cesarean section	Twins	1 died at 1 yr.; 1 died at 1 wk.
	Classical cesarean section	Achon. female, 3,345 Gm.	
	Porro	Unknown	Baby died
	Classical cesarean section	Normal male	Same person*
	Low cervical cesarean section after onset of labor	Achondroplastic male	Patient's family normal
	Cesarean section after onset of labor	Normal male	Patient's family normal

clinic, but, within a few days, sought readmission for the same complaints. This time, she was sent to the obstetric ward. There was no organic cause for this pain, for after she had become acclimated to her surroundings and realized that fellow patients, nurses, and medical staff were sympathetic, her complaints vanished. However, whenever she felt that she was not being given enough attention, her complaints would recur. Her exacerbation of pain and immediate response to sympathetic attention and sterile saline hypodermic injections followed an infantile behavior pattern. She was often childish in her expressions and activity, and spent much of her time cutting paper dolls.

The patient was 42 inches tall and normally weighed about 61 pounds. On April 10, 1944, her weight was 70 pounds and two months later, at the time of delivery, it was 76¼ pounds. She never presented signs or symptoms of toxemia. Although her body features were small, her external genitalia were well formed. Her bony pelvis, however, was definitely small. By x-ray, the pelvis was found to be platypelloid in character. The anteroposterior diameter of the inlet was 7 cm., the transverse diameter 9.5 cm., and the interspinous diameter 7 cm.

Since the last menstrual period and expected date of confinement were not definite, and the baby was small, it was decided to keep the patient under observation and perform a cesarean section just as soon as she went into labor. On June 3, 1944, at 8:00 A.M., spontaneous labor began. The baby was estimated at 4½ pounds and the vertex was floating. The

patient was taken immediately to the operating room where a low flap cesarean section under local anesthesia was performed without difficulty.

The baby was a female, weighing 4 pounds, 15 ounces, and measuring 16 inches in length. Unfortunately, the baby had multiple congenital deformities and died three hours after delivery. An autopsy disclosed the following abnormalities: meningocele, polydactylysm, congenital polycystic kidneys, congenital cystic liver, cor biloculare, atresia of urinary bladder, split tongue, prematurity, and partial expansion of lungs with congestion and hemorrhage. No instances were encountered in the literature of babies born of pituitary dwarfs with congenital anomalies of this type.

The patient ran a nonmorbid postoperative course which, except for a mild infection at the site of a tension suture, was uneventful. She was discharged on the twenty-fifth day in good condition.

Conclusions

1. From the available literature, the true dwarfs seem, invariably, to give birth to normal babies.
2. Achondroplastic dwarfs frequently give birth to achondroplastic babies, indicating the presence of an hereditary factor.
3. Achondroplastic dwarfs should be forewarned of the strong possibility of having an achondroplastic child.
4. True dwarfs can be told that their chances of having a dwarf child would be the same as that of normal individuals.
5. The antepartum course of a pregnant dwarf does not seem to be different from that of a normal individual.
6. Pregnancy in a dwarf should be terminated by an elective cesarean section.

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ETIOLOGY AND TREATMENT OF HEARTBURN OF PREGNANCY

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IT HAS often been said that the degree of our knowledge of any pathologic condition can be accurately measured by the number of remedies for the condition which are in current vogue. Usually the more remedies advocated for a disorder, the less is known about it. This is quite true in the case of heartburn, especially that variety associated with pregnancy.

Causative Factors

Interestingly enough, as Alvarez¹ has pointed out, heartburn rarely is associated with organic disease, which may be one reason for the lack of real interest in its treatment. However, the persistence of even a slight degree of heartburn will tend to lower the efficiency and morale of the pregnant woman; and if the condition is more severe and occurs at night, it might well interfere with sleep, and thus be a potential threat to the welfare and health of the patient.

There have been cited a great many possible causative factors, and treatment has been based upon these. One of the most commonly accepted theories is that popularized by Jones and Richardson.² They distended various portions of the esophagus in 29 patients by means of a small rubber balloon. No less than 19 of the patients complained of a hot, burning sensation when the lower third of the organ was distended. Furthermore, if quantities of acid, alkali, barium suspension, or even cold water were introduced through a tube, heartburn followed and was accompanied by spasm and reverse peristalsis of the region of the esophagus where the fluid had been given.

The acidity of the gastric contents was once thought to play a major role, but the work of Barsony and Szemzo³ and others^{1, 4} seems to have minimized its importance. As a matter of fact, during pregnancy when heartburn is very common, Strauss and Castle⁵ have shown that gastric acidity decreases as the pregnancy advances, and is at its lowest point during the third trimester, when the heartburn is most prevalent and severe. Obviously the use of alkalinizing agents such as sodium bicarbonate is completely without rationale.

Changes in the Stomach During Pregnancy

Although many additional theories as to the etiology of heartburn have been propounded, it is not within the scope of this report to list them all, but rather to concentrate on the most likely causative factors as related to the gravid state. Williams⁶ has summarized the changes in the stomach and its physiology during pregnancy. Normally the stomach lies in an essentially vertical position. However, as pregnancy proceeds, the enlarging uterus encroaches upon the abdominal organs and forces the stomach out of position. Thus, at or near term, the gastric fundus has been pushed up under the left leaf of the diaphragm and the axis of the stomach rotated about 45 degrees to the right. In addition, the greater curvature has been forced nearer the cardia. Such changes hinder the emptying of the stomach and tend to precipitate waves of reverse peristalsis.

There is also an increasing atony of the stomach musculature as pregnancy progresses. The cardiac sphincter, as well as the lower end of the esophagus, seem to be particularly involved in this process, thus permitting easy access of gastric contents into the distal esophagus. This may explain why heartburn during pregnancy is complained of more frequently when the patient is in a recumbent position; as a matter of fact, many patients have the distress only during the night.

A third major change in the physiology of the stomach during pregnancy is its diminished motility. Normally the emptying time of the stomach is about two hours, whereas in pregnancy this time may be doubled.⁷

Neuromuscular Theory

On the basis of the above-noted changes in the stomach during gravidity, we can readily understand the neuromuscular theory of heartburn. According to the proponents of this hypothesis, heartburn is the result of a regurgitation of gastric contents into the distal esophagus with its sensitive neural endings plus the intermittent spasm of the pyloric sphincter.

Williams⁶ actually demonstrated these suppositions with the aid of a barium meal and fluoroscopy. In the cases he studied he found no evidence whatsoever of any anatomic derangement other than those physiologic ones previously mentioned.

Treatment

With such a theory of disturbed neuromuscular function of the stomach and esophagus, it was rational⁶ to consider the use of prostigmine, a synthetic cholinergic drug, as a therapeutic agent. This drug has been shown both experimentally and clinically to have a very definite peristalsis-increasing effect on the intestinal tract.⁸⁻¹⁰ Since the esophagus and stomach are embryologically derived from the same tissue as is the intestinal tract, it seemed not unreasonable for Williams⁶ to experiment with prostigmine. He reported 16 cases of heartburn during pregnancy thus treated. Each patient was given 0.5 mg. prostigmine methylsulfate subcutaneously. In 14 instances relief was considerable or complete within twenty-four hours. Half of his cases reported a recurrence of symptoms within a week or ten days, but were again relieved with another injection of prostigmine.

Realizing that the condition occurs more often during the night or at other times when immediate access to the attending physician is not convenient or practicable, we decided to determine the value of prostigmine bromide tablets given by mouth.

Accordingly, 20 pregnant women complaining of heartburn were given a supply of prostigmine bromide tablets (15 mg. each), and instructed to take one as soon as the symptom appeared. Fifteen of the 20 patients reported complete relief within fifteen minutes after taking one tablet. If the symptom recurred (as it often did each day), another tablet of prostigmine bromide gave similar, prompt relief. Two patients reported partial relief; two obtained no benefit at all; and in one case the results were inconclusive (see Table I).

TABLE I

PATIENT	ONSET AND SEVERITY	DOSE FOR RELIEF	RESULTS
1. P. W.	33rd wk., severe at night	15 mg. p.r.n.	Immediate and complete
2. H. A.	30th wk., severe at 2 A.M.	15 mg. p.r.n.	Immediate and complete
3. F. C.	27th wk., after meals	15 mg. p.r.n.	Immediate and complete
4. I. C.	28th wk., severe at 2 A.M.	15 mg. p.r.n.	Immediate and complete
5. R. K.	24th wk., after supper	15 mg. p.r.n.	Immediate and complete
6. A. S.	29th wk., severe after meals	15 mg. (10 doses)	No relief
7. O. C.	27th wk., 10 P.M. with vomiting	15 mg. (2 doses)	No relief
8. H. N.	21st wk., severe after meals	15 mg. p.r.n.	Immediate and complete
9. F. G.	32nd wk., severe after meals	15 mg. p.r.n.	Immediate and complete
10. R. C.	12th wk., severe at 2-3 A.M.	15 mg. p.r.n.	Immediate and complete
11. S. B.	30th wk., mild after supper	15 mg. p.r.n.	One tablet at bedtime gave relief
12. J. R.	31st wk., severe	30 mg. p.r.n.	Delayed but complete relief
13. A. G.	36th wk., mild	15 mg. (3 doses)	Inconclusive
14. L. W.	34th wk., severe all day and night	30 mg. p.r.n.	Partial relief
15. N. McK.	27th wk., severe after meals	15 mg. p.r.n.	Immediate and complete
16. C. F.	36th wk., mild after meals	15 mg. p.r.n.	Partial relief
17. A. W. F.	21st wk., mild	15 mg. p.r.n.	Complete
18. S. B.	28th wk., severe at 1-2 A.M.	15 mg. p.r.n.	Complete
19. R. H.	16th wk., after meals	15 mg. (one dose)	Immediate and complete relief. Reaction—abdominal pain, headache
20. R. F.	20th wk., mild after meals	15 mg. (4 doses)	No relief

Discussion

Many of our cases complained of heartburn only at night, being awakened by the discomfort at two or three o'clock in the morning. Most of these found by experience that they obtained more benefit by waiting until the onset of the symptoms than by taking a prophylactic dose of the drug immediately prior to retiring. This was not unexpected since it was realized that the action of a single 15 mg. tablet of prostigmine bromide persists no more than a few hours at most. Nevertheless, a few patients stated that such a prophylactic dose ensured a full night's sleep without discomfort. Undoubtedly the diminished gastric motility with the consequent delay in absorption of the drug from the gastric and upper intestinal mucosae was one explanatory factor in these cases.

Inasmuch as the single, effective dose is so small, there is little or no likelihood of the appearance of any side reactions. Furthermore, there is no danger of the drug causing an interruption of the pregnancy, as has been shown on numerous occasions.¹¹⁻¹⁴

Summary

1. Heartburn of pregnancy is a very common condition.
2. It is now believed that a neuromuscular dysfunction of the esophagus and stomach is the underlying etiologic mechanism.

3. Prostigmine bromide by mouth is a rational therapeutic agent and has been demonstrated to afford prompt and complete relief in 15 out of 20 patients, and partial relief in another two.

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UNION CENTRAL BUILDING

THE ROUTINE USE OF STILBESTROL FOR ENGORGEMENT AND LACTATION IN NONNURSING MOTHERS

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THE employment of stilbestrol for the inhibition, suppression, prevention, or termination of engorgement and lactation has become rather popular. Some observers¹⁻⁵ have noted the prevention of engorgement of the breast and its associated pain with the use of stilbestrol. Others^{1, 6-9} have reported the inhibition, suppression, or prevention of lactation following its use. It is to be noted, however, that others^{10, 11} refer to the return of engorgement following the discontinuance of this hormone.

The foregoing prompted this study in an effort to determine the value of the routine use of stilbestrol in the prevention of engorgement, with its attendant pain, and lactation in nonnursing mothers.

This study is based upon the observation of 100 postpartum patients who did not nurse their babies for the following reasons:

1. Stillborn babies or babies that died shortly after birth.
2. Inverted nipples.
3. Difficulty with nursing following previous pregnancies.
4. Contemplated early return to employment.
5. Other children to be cared for at home.
6. Considering travel to be with husband who was in military service.
7. By preference, without any other reason.

These 100 patients were divided into two groups of 50 each, one of which received stilbestrol (diethylstilbestrol), and the other, a control group, who were not given any stilbestrol. In the former group stilbestrol was started within twenty-four hours of delivery. The dosage used was 10 mg., three times a day, for two days, followed by 5 mg., three times a day until the patient was discharged from the hospital. The oral route of administration was chosen.

The observations were recorded by the Obstetrical Nursing Supervisor, or, in her absence, by a nurse who was instructed by her, or by the attending physician. The observations included the noting of pain, engorgement, milk, fever, and erythema of the breast. The presence and degree of engorgement were determined by noting whether the breasts were soft, filling, full, or hard. If pain was present, the necessity for, and type of, relief required for the pain was recorded. Colostrum and milk were recorded as absent, expressed, or leaking.

None of the patients studied received any saline cathartics to prevent engorgement, and no restrictions were placed on fluid intake. Binders were used only when engorgement was present.

The period of study extended from Dec. 12, 1944, to Mar. 27, 1945. There were 93 private and 7 service patients in the entire series. The private cases represented patients of a number of physicians on the general staff as well as from the Department.

The type of delivery in the control group included: spontaneous, 34; low forceps, 6; mid-forceps, 2; version and breech extraction, 2; breech extraction, 1; bagging, version, and breech extraction, 1; and cesarean section, 6. There were two sets of twins in the foregoing group.

The type of delivery in those receiving stilbestrol included: spontaneous, 38; low forceps, 12; and breech extraction, 1. In this group there was one set of twins.

There were 24 primiparas, or 48 per cent, and 26 multiparas, or 52 per cent, in the control group. The corresponding figures for the stilbestrol group were: 21 primiparas, or 42 per cent; and 29 multiparas, or 58 per cent.

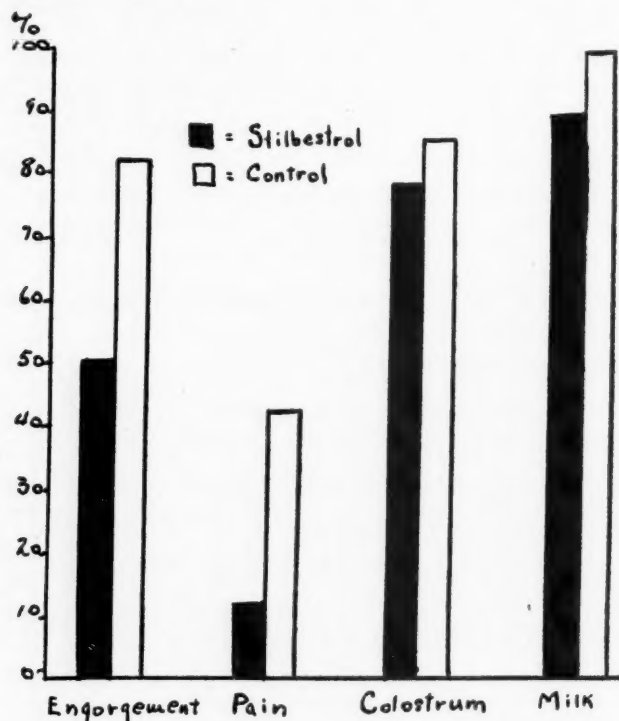


Fig. 1.—Comparative effects of stilbestrol upon engorgement, pain, colostrum, and milk in treated and control groups. Each column represents the percentage of patients in whom engorgement, pain, colostrum, and milk were present in the respective groups.

Results in the Stilbestrol Group

Engorgement was present in 25 patients, or 50 per cent, and absent in a similar number. The degree of engorgement was: filling in 10, or 20 per cent; full in 11, or 22 per cent; and hard in 4, or 8 per cent (Fig. 2).

Pain was present in 6 patients, or 12 per cent, and absent in 44, or 88 per cent. Relief of pain was not required in any patient in this group.

Colostrum could be expressed from the breasts in 39 patients, or 78 per cent, and was not present in 11, or 22 per cent. Leakage of colostrum was uniformly absent in this group.

Milk could be expressed, where there was no leakage of milk, in 28 patients, or 56 per cent. Leakage was present in 17, or 34 per cent of the patients, and absent in 5, or 10 per cent. Therefore, lactation was present in 90 per cent of this group, as manifested by leakage or expression of milk.

Fever was present in one patient, but could not be attributed to the breasts, and was probably due to endometritis.

Erythema was not noted in any patient in this group.

It is of interest that 50 per cent of this group of patients developed full, painful breasts at some time within two weeks after leaving the hospital.

Results in the Control Group

Engorgement was present in 41 patients, or 82 per cent, and absent in 9, or 18 per cent, of this group. The degree of engorgement was filling in 2, or 4 per cent; full in 17, or 34 per cent; and hard in 22, or 44 per cent (Fig. 2).

There was pain of varying degree in 21, or 42 per cent, of patients in this group; and in 29, or 58 per cent, it was absent. Pain was severe enough to require relief in 6 patients, or 25 per cent of those having pain, or 12 per cent of the entire control group. For the relief of pain codeine and aspirin were used in 3 cases; codeine, aspirin, and ice cap in 2 cases; and codeine, aspirin, and breast pumping in 1 case (Table I).

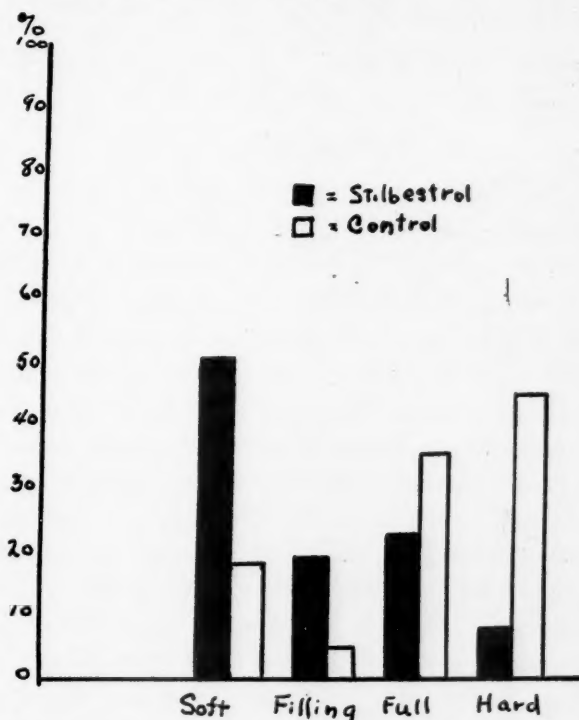


Fig. 2.—Relative degrees of engorgement in treated and control groups. Each column represents the percentage of patients in whom the various degrees of engorgement were present in the respective groups.

Colostrum could be expressed from the breasts in 42 patients, or 84 per cent, and was not present in 8, or 16 per cent. Leakage of colostrum was absent in all patients in this group.

Milk could be expressed, where leakage was not present, from the breasts of 12 patients, or 24 per cent. Leakage of milk was present in 38 patients, or 76 per cent. In other words, 50 patients, or 100 per cent of this group lactated, as manifested by leakage or expression of milk (Table II).

Fever was present in 5 patients, or 10 per cent of this group. In none, however, could the elevation of temperature be attributed to the breasts. It was apparently due to endometritis in 2, postcesarean pneumonia in 1, postcesarean infected abdominal wound in 1, and postcesarean (extraperitoneal) infection in 1.

Erythema of the breasts was not noted in any patient in this group.

The comparative effects of stilbestrol upon engorgement, pain, colostrum, and milk in the treated and control groups are shown in Fig. 1.

TABLE I. EFFECT OF STILBESTROL UPON PAIN

CONTROL GROUP				STILBESTROL GROUP			
PRESENT		ABSENT		PRESENT		ABSENT	
NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
21	42	29	58	6	12	44	88
Relief of pain was required for 6 patients, or 12 per cent of this group				Relief of pain was not required for any patient in this group			

TABLE II. EFFECT OF STILBESTROL UPON MILK SECRETION

CONTROL GROUP				STILBESTROL GROUP			
EXPRESSED		LEAKAGE		EXPRESSED		LEAKAGE	
NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
12	24	38	76	28	56	17	34
Lactation was present in 100 per cent of this group				Lactation was present in 90 per cent of this group			

Discussion

The observations in this study clearly indicate that the oral administration of stilbestrol to nonnursing patients by the method and in the amounts used prevents engorgement and inhibits lactation. It must be emphasized, however, that this action occurs only during the time of administration of the stilbestrol. Since it has been noted that engorgement appears in the period subsequent to the discontinuation of the hormone, one gathers the impression that engorgement is not actually prevented, but merely postponed, when this form of therapy is employed. In addition, engorgement of the breast is not always accompanied by pain. However, in this study where pain was present, it was always associated with engorgement. Furthermore, although pain was predominantly prevented by the use of stilbestrol, one must consider the degree of pain that was present in those patients not receiving the medication. From the experience gleaned from this study, showing that few patients require relief of pain with engorgement, we cannot help but feel that pain is practically a negligible symptom.

The inevitable conclusion from these observations is that stilbestrol exerts a definite physiologic action on the breast of the nonnursing patient in the method and amount employed. However, there is a question of the actual need for preventive therapy of this type, as determined by the minor degree of pain observed in this study. Furthermore, at this particular time, with the shortage of nursing personnel, the question might well be raised as to whether we are justified in burdening our nursing staffs with the added duty of supplying medication to patients, 88 per cent of whom do not require it. The remaining 12 per cent who might require relief of symptoms, if no prophylactic stilbestrol is used, can easily and effectively be treated by other medication should the occasion arise. In addition, stilbestrol used in this manner increases the cost of hospitalization, even though such expense is minimal, and the possible benefits to be derived from its use are negligible. Finally, in many instances the patient ultimately suffers from symptoms of delayed engorgement at an inopportune

time, i.e., at home, when she might have experienced the unpleasant symptoms in the hospital where they could be cared for under more favorable circumstances.

Notwithstanding the foregoing opinion, stilbestrol prophylactically has a definite place in the prevention of engorgement and suppression of lactation. It can be used with potential maximum benefit in postpartum patients in whom a slight degree of pain or the mechanical strain of engorged breasts may jeopardize recovery. Such conditions include cardiac decompensation, pneumonia, and other postpartum complications.

In the final analysis, one feels that this and previous studies demonstrate the physiologic action of an endocrine agent in an appropriate situation. From a practical therapeutic standpoint, however, the question may well be raised as to whether its routine use is really indicated.

Conclusions

1. The oral administration of stilbestrol in nonnursing mothers appears to prevent engorgement of the breast with its attendant pain. Actually, however, in many instances this is merely postponed.
2. Lactation is inhibited to a slight degree.
3. The advisability of routinely administering stilbestrol to nonnursing mothers for the prevention of painful, engorged, and lactating breasts is questionable.

The author wishes to acknowledge his appreciation of the assistance rendered in this study by Miss Gudrun Lund, Obstetrical Nursing Supervisor, and Miss Margaret A. Fay, Record Librarian of the Swedish Hospital.

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PENICILLIN IN OBSTETRICS*

A Preliminary Survey

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THE treatment of those obstetric complications in which infection creates the major hazard has long been a source of anxiety. The advent of sulfonamide therapy placed a potent weapon in our hands, one which we have no desire to minimize; however, experience with these preparations has shown a variety of side reactions which have limited therapy somewhat, and which must always be considered before the drug is used.

Among these contraindications and limitations are: nephritis, hepatitis, severe anemia, agranulocytosis, sensitization, nausea, urinary crystallization, and slow absorption from the gastrointestinal tract when its motility is impaired in the course of an acute infection.

Penicillin apparently produces no untoward reactions¹ and has reputedly a proved efficiency one thousand times greater than the sulfonamides.² The drug is usually administered parenterally and therefore there should be complete absorption of any given amount. The dosage used in this series was entirely empiric and could perhaps be safely reduced by resorting to any one of the various methods for prolonging the rate of absorption, namely: excretory blockade,³ suspension in oil and beeswax,⁴ local refrigeration,⁵ and suspension in plasma.⁶

The specific efficiency of penicillin has been proved by many investigators.¹ In obstetrics the *Streptococcus hemolyticus* is by far the most common invader and fortunately is extremely penicillin sensitive. There are a few strains of this and the staphylococcal group which are penicillin resistant and therefore occasional failures may occur. In these cases, penicillin sensitivity may be readily assayed.⁷

Acute Mastitis.—Nine cases of acute mastitis are reported. The diagnostic criteria included pyrexia of 100° to 104° F., cellulitis, erythema, and localized tenderness. Two patients also exhibited initial chills and most of the patients appeared toxic. The onset of infection occurred between five and sixteen days post partum. One patient developed her symptoms fifty-two days post partum and was readmitted to the hospital for treatment.

The minimum dosage in this series was 180,000 units, the maximum 900,000 units, and was in direct proportion to the apparent virulence of the organism and the degree of breast involvement. Therapy was continued twenty-four to seventy-two hours. The patients were clinically cured within five days even though in all but one instance therapy was discontinued after forty-eight hours.

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†For lack of space, the extended tabulations of cases cannot be included here.

The erythema and cellulitis were invariably diminished 50 per cent within the first twenty-four hours of therapy and had practically disappeared in forty-eight hours. The patients were considered cured when temperature and pulse had been normal for three days and when there was complete absence of erythema, tenderness, and induration. In this latter respect the end results were much more satisfactory than those following sulfonamide therapy. Two patients resumed nursing, and it is probable that more could have done so on the basis of the rapidity and completeness of their recovery. No local therapy was used in this series.

Cesarean Section.—Penicillin was used sixteen times following cesarean section. In the first six patients administration was started immediately following operation. Under modern concepts of obstetrics, these patients were potentially or actually infected.⁹ Two had been in labor forty-six and forty-eight hours; one, fourteen hours; one, thirteen hours; one, twenty-four hours; and one, ninety-six hours. The membranes had been ruptured for eight, fourteen, thirty, forty-eight, and seventy-two hours. One of these patients had previously been subjected to radical cauterization of the cervix on two occasions, bilateral bartholinectomy with subsequent excision of fistulous tract and unilateral salpingo-oophorectomy; all for previous Neisserian infection. All the cesarean sections were of low cervical type except one, which was of the classical type. This latter patient had a fibroid uterus with extensive hysteroabdominal adhesions; the membranes had been ruptured for seventy-two hours and a Voorhees bag used unsuccessfully before admission. The patient had been in inertial labor for ninety-six hours, the cervix was dilated 3 cm., and the fetus had been dead at least forty-eight hours. The postoperative course of one patient in whom the membranes had been ruptured for thirty hours and who had been in inertial labor for twenty-four hours was absolutely afebrile. Three patients exhibited first febrile zone reactions, and two, second febrile zone.⁸ Temperature and pulse returned to normal in two patients in forty-eight hours, in one patient in seventy-two hours, in another in ninety-six hours, and in the patient upon whom classical section had been performed in one hundred twenty hours.

The minimum dosage of penicillin in this series was 100,000 units, the maximum dosage 900,000 units.

All patients left the hospital within fourteen days after operation.

Uterine cultures were taken on four patients at operation; three were negative and one positive for hemolytic streptococcus.

There was no maternal mortality.

In the other ten patients therapy was started when clinical evidence of infection appeared. Sections were as follows: three classical, four low cervical, two extraperitoneal supravescicular, and one Porro. In seven patients the membranes were intact; in three they had been ruptured seven, twenty-two, and forty hours, respectively. Three patients were not in labor; five were in labor eighteen, twenty, thirty-six, forty-four, and sixty hours, respectively. Two patients were sectioned for abruptio placentae. The postoperative febrile reaction in all instances reached the second zone. Of two uterine cultures taken at operation, one was positive for hemolytic streptococcus.

The minimum dosage of penicillin was 225,000 units; the maximum, 1,575,000. Five patients received supplementary sulfonamide therapy but in only three instances could the amount be considered of any therapeutic value.

The shortest hospital stay was sixteen days, the longest forty-two days. It is apparent that withholding penicillin therapy until the onset of clinical symptoms of infection definitely prolonged hospitalization and increased dosage.

There was no maternal mortality.

Endometritis.—Under the heading of endometritis we have grouped a series of eleven patients who had been delivered vaginally and who exhibited pyrexia, profuse foul lochia, uterine tenderness, and systemic toxicity. The uterine cultures contained hemolytic streptococci and *Staphylococcus albus*.

The complications of labor included two cases of retained placenta with postpartum hemorrhage, and two cases of inertial labor with transverse arrest. In seven patients no

apparent complications occurred during labor. In seven instances there were no operative procedures; in two the placenta was removed manually and the uterus was packed. One patient was delivered by internal podalic version and extraction; and, following an inertial labor of ninety hours, one patient was delivered by internal podalic version and extraction preceded by the use of a Voorhees bag.

The lowest temperature elevation in this series was 100°, the highest 108° F.

Sulfonamide therapy of inadequate dosage was given to two patients.

The minimum dosage of penicillin was 195,000 units; the maximum dosage was 1,375,000 units in a patient whose uterine culture was positive for *Staph. albus*.

The febrile reaction following penicillin therapy lasted twenty-four hours in three instances, forty-eight hours in three, seventy-two hours in two, ninety-six hours in one, one hundred forty-four hours in one, and one hundred sixty-eight hours in one.

The shortest hospital stay was nine days in a patient who had a pure culture of hemolytic streptococci and the longest hospital stay was twenty-two days in the patient who had *Staph. albus* culture.

There was no maternal mortality.

Septic Abortion.—There were four cases of septic abortion and one incomplete induced abortion, in whom, despite a normal temperature, *Staph. albus* was cultured from the uterus. Three of these patients had moderate to severe secondary anemia. One patient had 710,000 red blood cells and a hemoglobin of 16 per cent; the other two patients had hemoglobins of 40 and 65 per cent, respectively. Hemolytic streptococcus and *Staph. albus* were positive findings in four of the five patients.

One patient received four transfusions; one, three transfusions; and one, two transfusions. Two had secondary evacuation of retained placental tissue. One had an afebrile course, two had pyrexia for three days, one for six days, and one for thirteen days. Inadequate sulfonamide therapy was used in one patient. The dosage of penicillin administered ranged from 320,000 to 1,200,000 units. Temperature and pulse remained normal in one patient, and fell to normal in twenty-four hours, seventy-two hours, ninety-six hours, and one hundred forty-four hours, respectively, in the remaining patients.

The shortest hospital stay was eleven days; the longest was nineteen days. All recoveries were complete.

Gonorrheal Infection.—There were three cases of proved gonorrheal infection. One prenatal patient had an acute unilateral Bartholin's cyst which was draining on admission. Smear from the infected area was negative in forty-eight hours following administration of 200,000 units of penicillin. One patient had a positive smear following incomplete septic abortion and was discharged as cured ten days after admission following administration of 665,000 units of penicillin.

One baby developed ophthalmia neonatorum. Cultures were negative in twenty-four hours following local and systemic treatment.

Pyelitis.—One patient developed pyelitis. Urine culture was positive for streptococcus. She was given penicillin with definite improvement in her symptomatology. In this case other complicating factors prolonged her convalescence.

Pelvic Cellulitis.—One patient with history of retained placenta in both previous deliveries again required manual removal. Following an average hospital tenure she was readmitted ten days later with massive pelvic cellulitis and showed no improvement in spite of apparently adequate penicillin therapy. It is possible that the organism in this instance may have been penicillin resistant.

Phlebitis.—Penicillin was given to two patients for phlebitis. In one of these patients the temperature dropped to normal following 200,000 units. A sympathetic block, however, preceded this therapy. The other patient showed no improvement. She had received 240,000 units of penicillin.

Acute Suppurative Mastitis.—One patient was admitted with acute suppurative mastitis. This was treated with sulfonamides, hot compresses, and incision and drainage. Erythema, induration, and tenderness persisted, and new areas apparently were developing.

Three hundred thousand units of penicillin were given. The breast was considered free of infection within forty-eight hours and convalescence was uneventful.

Summary

We have reported a series of forty-five patients treated with penicillin. Penicillin was given to nine patients for early acute mastitis.

Penicillin was used prophylactically in six patients subjected to cesarean section following complicated labors. Each of these patients could well have had a stormy convalescence. The drug was given to ten other patients following cesarean section when clinical evidence of infection was present.

Eleven patients with postpartum infection were treated.

Five septic abortions are included in this report.

Three cases of known gonorrheal infection, one of pyelitis, one of pelvic cellulitis, two of thrombophlebitis, and one of acute suppurative mastitis are also included.

Conclusions

1. Penicillin apparently deserves serious consideration in obstetric complications attended by infection, potential or actual.

2. Acute mastitis responds with amazing rapidity. It is possible that lactation may be resumed.

3. The prophylactic administration of penicillin following prolonged rupture of membranes, prolonged inertial labors, and in other patients potentially infected is apparently effective in assuring a smooth convalescence and in shortening the period of hospitalization. If this is substantiated by further investigation, it will undoubtedly broaden the use of low cervical cesarean section. A routine culture should probably be taken from the lower uterine segment at operation.

4. The treatment of infection following cesarean section in this series has been effective.

5. In incomplete septic abortion, particularly where there is a marked secondary anemia, a leucopenia, or both, penicillin is undoubtedly safer than the sulfonamides. The absence of other undesirable features of sulfonamide therapy will also recommend this drug.

6. Previously reported efficacy in the treatment of gonorrheal infection is substantiated.

7. Pyelitis due to streptococcal infection may indicate penicillin therapy.

8. Our sole experience with postpartum pelvic cellulitis was disappointing; however, an occasional penicillin-resistant streptococcus or staphylococcus will undoubtedly be encountered, and may have been a factor.

9. No conclusions can be drawn concerning phlebitis.

10. Penicillin is apparently of value in the postoperative treatment of acute suppurative mastitis and may eliminate additional surgery. The disappearance of any vestige of induration has been an outstanding finding in our mastitis results.

11. This small series, in which there were no mortalities and in which the hospital stay was of shorter duration than one would expect, warrants accumulation of additional data.

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4709 FIFTH AVENUE

PRESACRAL SYMPATHECTOMY FOR INTRACTABLE FUNCTIONAL UTERINE PAIN*

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IN DISCUSSING even briefly any form of medical or surgical therapy for functional pelvic pain, which in most instances means uterine pain, an exposition of the supposed etiology of the condition is obligatory, for the treatment of this distressing disturbance is not solved by the exhibition of a few drugs, the manipulation of organs, nor necessarily the eradication of certain pain tracts.

In this connection, a casual acquaintance with ethnographic history through uncounted ages is illuminating, for it depicts the psychic blight under which menstruating women lived in primitive and medieval society. Now we are somewhat better informed on the physiology and pathology of menstruation. But without proper and due consideration of its psychological aspects, it is impossible to understand completely this fundamental evidence of femininity.

Of the various disturbances associated with menstruation, dysmenorrhea is patently the most common and most important of the functional alterations. The investigation of the cause of dysmenorrhea clearly involves as a first procedure a most thorough gynecologic examination. This will serve to determine whether or not the pain is really functional. All too often, however, will minor disturbances in the pelvis be found which by no stretch of the imagination, other than that of an eager surgeon, could possibly serve as a cause for the expressed pain. Nor do some of the occasional good results from surgical management of uterine malposition, asymptomatic ovarian cysts, cervical erosions, etc., justify the assumption that they were curative specifically for the pain of which the patient had been relieved. In many instances, they are merely the psychological placebos which relieve the psychogenic pain and often are only as long lasting as a placebo may be.

Let one but review the operating schedules on the gynecologic wards of twenty years ago with those of today and note how time and experience have dealt with displacements of the uterus as causes for female pelvic pain, or whatever else the patient complained of. The same applies to cervical stenosis. Congenital failure of development or infantile uterus, follicular cysts of the ovary, and a variety of other conditions, are given as causes for dysmenorrhea. At present, endocrine deficiencies of one type or another, or all types put together, are assumed as etiological factors. If the physician is sufficiently observant, experienced, and honest, and has sustained enough disappointments in therapy, he inevitably recognizes the psychoneurotic side of dysmenorrhea. The more he knows of conditioning factors and psychological trauma of the patient's early girlhood and adolescence, the more will he consider her psychological

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rather than her gynecologic poise. A woman with any psychoneurotic tendency or imbalance may make the all-important and ultrafeminine mechanism of menstruation the subconscious recipient of emotional fears and terrors to produce the symptom of dysmenorrhea.

The failure to find any basic pathologic or anatomic change in the uterus with any degree of consistency in the vast majority of these girls, the modification of the pain in any given period by unexpected happenings, the relief experienced by impossible medication, spontaneous relief through sexual activity or pregnancy, all show the tendency of the symptom complex to be as unpredictable and as unsolvable as the symptom complex of "nervous indigestion."

From the foregoing it is manifest that I do not regard functional uterine pain, or dysmenorrhea associated with minor degree of pelvic pathology, which experience has shown not definitely pain producing, entities necessarily responsive to medical, surgical, or endocrine therapy. Rather is it commonly a psychosomatic unit, the understanding of which on a psychological basis is more important than the understanding of the patient's pelvis. It is with some temerity, therefore, that I propose to discuss and give the results of a surgical therapeutic approach to this problem for sharply defined group of patients. The operation of *presacral sympathectomy* in itself is symptomatic therapy, since the pain-producing agent is not the presacral plexus. It is merely the tract by which the painful impulses are transmitted. Until our understanding of psychological and pathologic processes improve, however, we will continue to apply nonspecific surgical treatment in order to gain symptomatic relief. The application of this statement is to be found in our present surgical approach to the problem of hyperthyroidism, where few of us believe that the thyroid gland itself is the primary offender. It is the responsive or reacting agent to outer disturbances, and it is the violence of the reaction which we seek to control by surgery, rather than eradication of the initiating disorder. My attitude toward the utilization of presacral sympathectomy for dysmenorrhea is comparable to that just expressed. I regard it as a means of severing the paths of painful uterine stimuli, no matter how produced, and in spite of the admitted probability that it is often a painful psychosomatic disorder of psychogenic origin. Nor do I expect that the operation will prevent necessarily the transference of an emotional conflict to another organ or organ-group with the development of symptoms, the character of which are dependent upon the organ neurosis engendered. Certain alterations of menstruation may be explained by the action of the central regulating mechanism in the brain and medulla oblongata exerting control on the autonomic regulating mechanism of the hypogastric (genital) plexus. (Parenthetically, the association of control may be better understood by recalling that to be found between the olfactory and genital organs of the dog.) Obviously, however, such alterations cannot be painful if the pain-carrying visceral afferent fibers are divided. However, it will, in carefully selected cases, eventuate in a cessation of uterine pain and an eradication of pain fixation to a fundamental and recurrent physiologic process. It is conceivable that transfer of symptoms might be to a more easily controlled sphere, or one less periodic or anticipated in form.

The innervation of the uterus is both by the sympathetic and parasympathetic systems. The motor fibers arise above the sixth and probably in the fourth dorsal segments of the cord, reaching the sympathetic chain by way of the white rami communicantes and traveling thence by the sympathetic plexuses to reach the uterus. Section of the cord at that level by injury or by high spinal or caudal anesthesia abolishes uterine contraction. This fact has been demonstrated and employed clinically to completely arrest premature labor contractions. Labor stops and the patient may be carried to term.

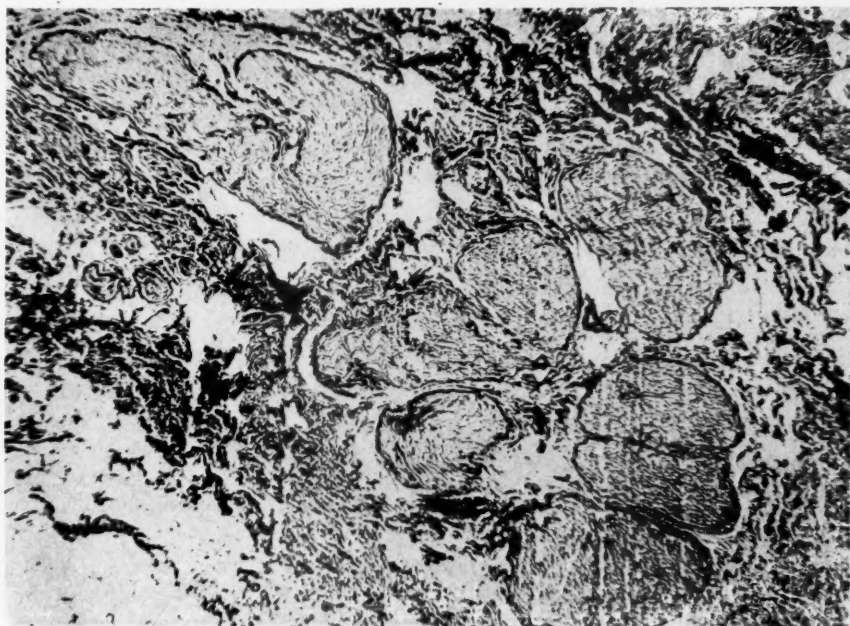


Fig. 1.—Cross section of approximately one-fourth of a resected plexus shows eight sympathetic fibers of major size. ($\times 75$.)

This autonomic mechanism is counteracted by the parasympathetic fibers of the sacral division, for when the influence of the latter is abolished by sacral anesthesia, there is cervical relaxation and an increase in tone and force of uterine contractions, but no alleviation of pain. Obviously, the sacral parasympathetics carry no uterine pain sensations, although the pain of dilatation of cervix and vagina is relieved. Anesthesia involving the eleventh and twelfth thoracic segments causes complete cessation of uterine pain without impairing uterine contractions. It is thereby demonstrated that the centripetal fibers transmitting painful uterine stimuli pass to this level. These sensory afferent fibers travel with the sympathetic nerves, and will be found in the superior hypogastric (presacral) plexus (Fig. 1).

It is evident therefore, that removal of the presacral plexus will arrest painful stimuli from the uterus, without materially altering those from cervix or upper vagina. The fibers carrying these pain sensations are regarded as special visceral afferents anatomically and functionally distinct from the sympathetics

with which they travel, since they are poorly myelinated, and course to the cord with no ganglion synapse before entering the posterior spinal root. All of our specimens of resected plexuses were submitted for examination (Dr. N. M. Alter) and a considerable number of ganglia were found. This is not in accord with the commonly held opinion that there are no ganglia in the presacral or superior hypogastric plexus. We regard these as ectopic ganglia of the sympathetic efferents, and not associated with the special visceral afferent pain tracts. (Figs 2 and 3.)

Since most of the motor sympathetics follow the aorta, hypogastric, and uterine arteries, to enter the uterus via the ganglion of Frankenhäuser, presacral sympathectomy will not obliterate the functional motor effectiveness of the sympathetic nerve supply. Theoretically, therefore, uterine pain relief without marked motor alteration may be expected. It is likewise apparent that the effectiveness of a presacral resection may be accurately presaged by inducing a sympathetic block at the eleventh and twelfth dorsal segments, where the special uterine afferents enter the dorsal roots with the sympathetic chain.

The following cases are selected from a larger group. They are presented because they illustrate in their case histories innocuous associated pathology, constitutional inadequacy, symptom transfer, and previous useless operations and hormone therapy. The pain relief after presacral sympathectomy is unquestionably ascribable to thorough removal of the plexus in such cases.

CASE 1.—Patient single, aged 19 years.

Surgical history: Mastoid operation, 1931 and 1942. Appendectomy and removal of two ovarian cysts, 1942.

Chief complaint: Severe dysmenorrhea since onset of flow, extremely severe for past six months, and in no wise relieved by the operation done one and one-half years ago. Frequent brownish vaginal discharge between periods. Also enuresis for years.

Examination and operative findings: Nothing except an innocuous lime-sized cyst of the right paraöophoron.

Operation, March, 1944: Cyst was removed, uterosacral ligaments shortened with Pagenstecher suture. A presacral sympathectomy was then performed. The first menstruation occurred six weeks after operation with absolutely no pain. However, since this girl had enuresis for years at night, psychoanalysis was recommended, but this was not carried out. She has had no pain with her periods since the operation, but believes her enuresis is worse. This may well represent a symptom transfer.

CASE 2.—White, well-developed woman, 25 years old, married five years but separated. Nothing of importance in the past history.

Chief complaint: Severe dysmenorrhea for nine years, becoming progressively worse, necessitating the loss of three to five days from her work each month.

Previous treatment: Various types of douches, one dilatation and curettage, one cervical dilatation, repeated injections of various types of hormones, and all forms of empiric oral treatment before she was seen here.

Pelvic examination: No pathology.

Because of the marital derangement, psychotherapy was first instituted after she was seen in May, 1942, combined with hormonal treatment. There was no improvement in her condition in the next fifteen months. Periods were associated with severe pain, nausea, and vomiting, and she was desperate for relief.

On Aug. 17, 1943, under 100 mg. of spinal anesthesia, a presacral sympathectomy was carried out, accompanied by an incidental appendectomy. Both tubes were markedly thickened at the cornual end with typical isthmica nodosa present. These were not touched. Except for one spell of pain with a left sacroiliac strain and sciatica in June, 1944, the patient has been well and free of all menstrual pain since the operation.

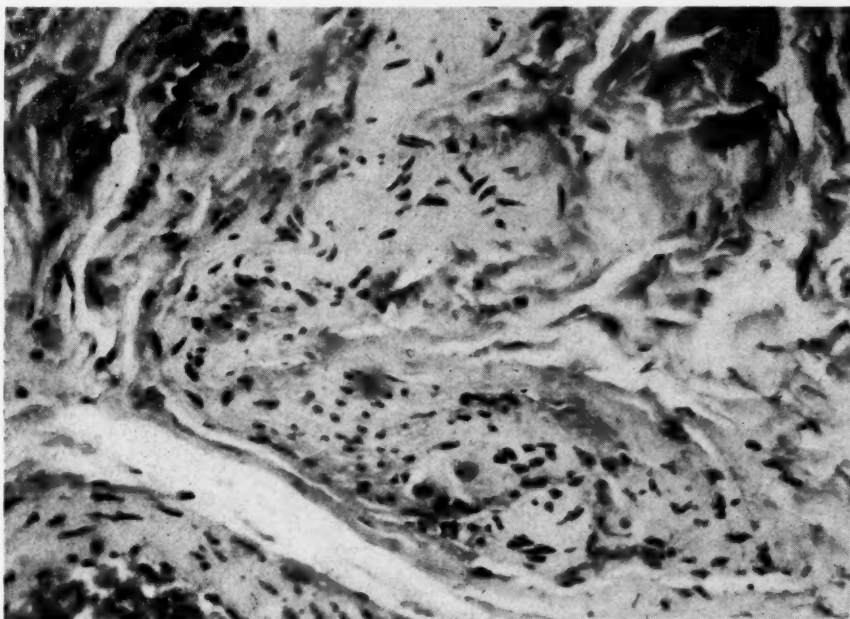


Fig. 2.—Presacral (hypogastric) sympathetic nerve fiber with distinct ganglion cells. ($\times 160$.)

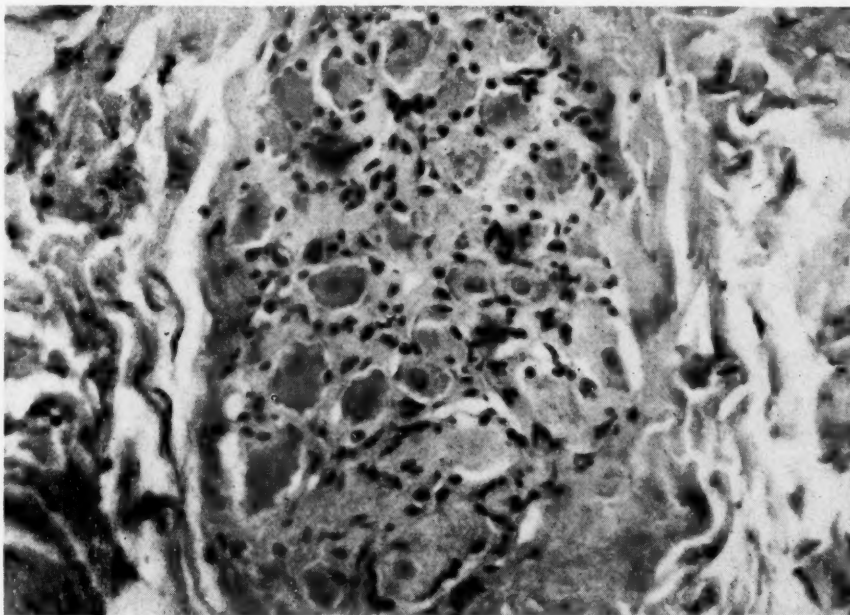


Fig. 3.—A complete ganglion showing numerous nerve cells, removed with the presacral (hypogastric) plexus. It is not commonly admitted that such ganglia exist in this area. ($\times 384$.)

CASE 3.—White, well-developed woman of 33 years, married six years. No pregnancies. Seen May, 1943. Previous surgical experiences, all for dysmenorrhea, were: operation, 1939, dilatation and curettage; 1942, dilatation and curettage; 1943, dilatation of cervix.

Chief complaint: Severe dysmenorrhea ever since patient started to menstruate at the age of 13 years, becoming worse the past two years, causing complete prostration for twenty-four to forty-eight hours after its onset. She experienced no relief following the surgical procedures mentioned above. No physical findings of interest, the uterus being small, anteflexed, and probably underdeveloped.

Treatment: She was treated with various medications and hormone therapy for three months without relief. In January, 1944, an operation was done in which there were no pathologic pelvic findings. A presacral sympathectomy was done with complete resection of all the nerve-bearing tissue in the interiliac trigone. An incidental appendectomy was also performed.

The patient began to menstruate four days after the operation, while in bed in the hospital, without being aware of the onset of her flow. She has been followed to date and her report is that she has been completely relieved of pain. Her only notation is that her periods seem somewhat more profuse than formerly.

Conclusions

Functional uterine pain commonly represents a psychosomatic disorder affixed to the predominant emblem of femininity. Psychotherapy offers more promise than correction of coexistent but completely innocuous findings of minor pelvic pathology.

When other treatment is inadequate, the pain may be effectively relieved by presacral sympathectomy. In patients with apparent emotional instability a preliminary low dorsal sympathetic block given at the onset of menstruation may be used as a diagnostic measure for pain-relief prognosis. Presacral sympathectomy will give the most notable results in cases with functional uterine pain similar to those quoted. It is also recommended as a surgical adjuvant where dysmenorrhea is an outstanding symptom-accompaniment to conditions such as impacted adherent retroversion and pelvic endometriosis with probable adenomyosis uteri in young women. It should be strictly limited in its application to patients who first have been competently treated by nonoperative methods, and should be performed by surgeons capable of removing the plexus in its entirety. The pain tracts in the special visceral afferent fibers must be completely severed to effect complete relief.

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INITIAL FETAL ATELECTASIS

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WHETHER the human fetal lung is atelectatic until birth is a question which has been debated for many years. Some have maintained that, due to intrauterine respiratory movements, the amniotic fluid enters the lung and may assist in dilating the alveoli in preparation for air breathing. Others, while admitting that intrauterine respiratory movements occur, view with apprehension the entry of amniotic fluid into the lung. It is pertinent to review the literature presenting the evidence.

As long ago as 1888, Ahlfeld¹ described rhythmic fetal movements which he observed in patients during the latter weeks of pregnancy. He suggested that this fetal activity was due to respiratory efforts and thought that aspiration of the amniotic fluid must occur. Many disagreed with this theory, but, in 1905, he again restated his beliefs, and produced convincing graphic records of the respiratory movements.² In the polemic which resulted, other investigators observed the intrauterine respiratory movements, but concluded that the force of the respiratory efforts was too weak to suck fluid beyond the usually closed fetal glottis.³ The argument then subsided, but has been raised again recently by investigators⁴ who demonstrated that respiratory movements draw amniotic fluid into the lungs. It was also stated: "There is evidence that intrauterine respiration is of a functional significance in the development of a normal lung, aiding in dilatation in alveoli and elastic walls of the future air passages."⁵

The injection of radiopaque material into the amniotic sac of experimental animals and the human being was attended by significant results. In the unanesthetized and unoperated guinea pig, the radiopaque material appeared in the lungs only when anoxemia was present.⁶ In the human experiments, the use of thorotrast seems to indicate that fetuses of six months' gestation do aspirate amniotic fluid in utero.⁷ Other similar experiments^{8, 9} were performed in the human being with results which may be questioned, since we do not know whether physiologically normal conditions prevailed.

The experimental injections of dyes^{4, 9, 10, 12} or particulate matter into the amniotic sac, and studies of the vernix-filled lungs from stillborn infants¹³ have proved that aspiration of amniotic sac contents can occur. The experimental evidence available at the present time seems to indicate that fetuses are apneic during the greater part of gestation, and that fetuses whose oxygen requirements are adequately met are apneic until birth.¹⁴

Differences in opinion would seem to depend upon lack of knowledge of the normal structure of the fetal lung at full term. This paper briefly presents two congenital anomalies which may clarify the structural picture of the lung just before birth.

Method

Two stillborn fetuses were used and prepared in the following manner. As soon as possible following delivery, the trachea was exposed, clamped, and tied by ligature slightly above the thyroid gland. The fetuses were fixed by vascular perfusion with formalin. After

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removing the skin, subcutaneous tissues, and large chest muscles, they were immersed in 10 per cent formalin until the lungs hardened in situ. The fetal lungs were then removed, blocks were cut from representative regions, and sections were made. These were stained by the routine hematoxylin and eosin method, and for epithelial elements by the Gram method decolorized by acid alcohol.

Case Reports

CASE 1.—S. B. (Hosp. No. 185541). The mother was a primipara, aged 25 years. Her last menstrual period was April 10, 1943. The term date was Jan. 17, 1944. The fetal heart tones disappeared or were not heard five hours before delivery. After the fetal heart tones were no longer heard, x-ray revealed the presence of a single anencephalic monster. The fetus was delivered spontaneously Nov. 27, 1943. The pathologic report was as follows: The body is that of an anencephalic female premature infant with a body length of 36 cm.; weight, 1,360 grams; and an estimated intrauterine age of seven lunar months. There is a complete absence of the cranial vault and, though the occiput is formed, there is a defect at the site of the anterior fontanel measuring 4 by 2 cm. through which protrudes some nervous tissue representing a rudimentary brain measuring 3 by 2 by 1 cm. The neck is not formed so that the head is between the shoulders.

CASE 2.—S. B. (Hosp. No. 185627). The mother was a multipara, aged 28 years. Her last menstrual period was March 22, 1943. The term date was Dec. 29, 1943. No fetal heart tones were heard at any time during labor. X-ray examination showed presence of a single anencephalic monster. The fetus was born Dec. 4, 1943. The pathologic report was as follows: The body is that of an anencephalic male premature infant with a body length of 41 cm., and an estimated intrauterine age of eight lunar months. The fetus weighs 1,650 grams. The head shows a complete absence of the cranial bones and a small amount of exposed nervous tissue represents a rudimentary brain in the malformed base of the skull.

Results

The lungs of these two fetuses showed complete atelectasis. They were compact gland-like organs whose respiratory passages were not filled. The larger bronchioles could be easily identified and had large lumina. The smaller bronchioles had folds of epithelium in them, whereas the more distal passages were either solid masses or partially formed alveoli. The epithelium of the alveoli was cuboidal or columnar, although all boundaries were not definite. Nuclei were spherical to ovoidal and stained darkly with hematoxylin. No epithelial elements were identified in the bronchioles or in the smaller passages. When present, cornified epithelial cells appear as long irregularly wavy coarse structures often turned on edge. Amniotic fluid, when present in the lungs, usually appears as a precipitate.

Discussion

Histologically, the lungs of the stillborn infant contain many fluid-filled alveoli and alveolar ducts.^{15, 16} Similarly, in experimental animals it has been observed that fluid-filled spaces occupy 20 to 30 per cent of the lungs before breathing has commenced.¹⁷ These observations suggest that fluid contained in the fetal lung is coextensive with that in the amniotic cavity. There is no proof that this is the normal condition because it is possible that, during the death of the fetus in utero, asphyxial conditions had induced intrauterine respiratory movements and led to aspiration.

Experimental evidence indicated that the lung of the guinea pig at full term is compact and hence the expanded fluid-filled lungs in question do not present a true picture of apneic fetuses.¹⁴ Reasoning from this and from correlated studies on anoxia, it seemed probable that an initial atelectasis is the

normal state in the lung of human fetuses. The two cases presented above may be regarded as an important link in the chain of evidence supporting this hypothesis. The fact that a marked anencephalus was present in each case suggests that there was a definite disturbance if not actual lack of central nervous system control of the body. Hence, it is highly probable that the fetuses in the final agonal movements preceding death were not able to make the dyspneic gasps observed in anoxic experimental animals. Therefore, the lungs were in the condition of a normal birth at term, namely, in the state of atelectasis. Thus, it was possible to secure in the human being a lung preparation very similar to that found in the experimental animal. Lungs of stillborn infants which have died asphyxial deaths in utero usually are partly expanded. Their bronchioles are opened, and the epithelial linings of ducts and alveoli are lower than in the atelectatic specimens. Masses of debris found in the amniotic fluid usually are present in the lumina of the bronchioles and alveolar ducts. In the cases presented the lungs were solid glandlike structures. There was no tracheal obstruction. The amniotic fluid had easy and complete access, and yet the alveoli were unexpanded and no microscopic evidence of the amniotic fluid or its contents was found. It has been concluded that intrauterine respiration in the experimental animal either does not occur or is too weak to cause aspiration of amniotic fluid. It is very possible that the same situation obtains in man. Indeed, Windle,¹⁴ after analyzing the observations of Potter and Bohlender,¹⁸ and others, makes the opposite suggestion, namely, that the lung contributes a gentle but persistent flow of transudate to the amniotic fluid.

We are not concerned with the histology of the pulmonary alveoli in this paper. If, however, it is appreciated that atelectasis persists until birth, then normally the cuboidal epithelium probably is present until air breathing is initiated and only then rapidly becomes thinner. This is demonstrated experimentally by Bensley and Groff,¹⁹ who observed that cuboidal epithelium persists as a lining of the pulmonary alveoli of the rat as late as the day before birth.

Summary

The existence of fetal atelectasis until birth has been well demonstrated in laboratory animals. A similar condition was thought to be present in the human fetal lung at term, but, because of the obvious difficulties in securing a specimen, this was never proved. The writer was fortunate in having fetuses which, because of an embryologic defect of the central nervous system, closely simulated the condition under which the lungs in experimental animals are studied. Since the results are similar, it is suggested that the initial atelectasis of the fetal lung persists in man until birth.

The author is greatly indebted to Dr. John McCarter for his assistance in the preparation of the specimens.

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Discussion

DR. WILLIAM F. WINDLE.—I have seen these microscopic preparations and believe they are in line with observations on experimental animals from my own laboratory. My colleagues and I have published several articles dealing with experiments demonstrating a state of initial atelectasis in the full-term guinea pig. When we published our observations, we did not think that anyone would ever demonstrate comparable pictures of the unexpanded fetal lung in the human being. I have seen small areas of initial atelectasis in stillborn human lungs, such as were described by Dr. Sidney Farber some years ago, but always there were many alveoli filled with aspirated material from the amniotic sac.

The lungs of almost any animal which has reached a state of maturity comparable to that of Dr. Zettelman's anencephalic human fetuses would be found in a state of partial expansion with amniotic fluid if death and the accompanying fetal asphyxiation should intervene before birth. This was not the case in Dr. Zettelman's anencephalic specimens and the reason may be that his specimens lacked a sufficiently well-organized respiratory center to respond to the stimulus of asphyxia.

I believe that the studies of Dr. Zettelman serve to complete the picture of conditions during fetal life. We now have a much better understanding of fetal respiration than we had a few years ago.

DR. EDITH L. POTTER.—The experimental approach has not yielded unequivocal results, and whether one accepts the tenet that, in the rabbit, guinea pig, and sheep, intrauterine respiration with an accompanying inflow of amniotic fluid is normal, or whether one believes this phenomenon never occurs except when the respiratory center is stimulated by a reduction in oxygen, appears to be largely determined by one's personal acquaintance with a particular group of investigators.

The problem in the human fetus is still more difficult of direct solution, and it is necessary to rely largely on indirect evidence. The material which has just been presented is a careful study prepared in an attempt to picture the normal intrauterine appearance of the human fetal lung and to show, thereby, that the pattern usually described as normal is not normal and is the result of anoxia with secondary aspiration of fluid.

Extreme caution must be exercised in the choice of material which is to be used to prove a point. The essayist has chosen the lungs from two extremely malformed fetuses weighing only 1,360 and 1,650 grams and has concluded that the appearance they present is what would be expected in a normal fetus at term, the average weight at this time being in excess of 3,400 grams.

My interest in the subject of intrauterine respiration has led me, in the last ten years, to examine histologic preparations of the lungs of over 5,000 human fetuses and newborn infants in all stages of development and exhibiting all types of pathologic lesions. Included

were the lungs of 106 anencephalic monsters, and the pattern just described gives an excellent picture of conditions as they frequently exist in the lungs of immature fetuses with this anomaly.

When any condition causes a reduction in the space available for lung growth, a definite inhibition of pulmonary maturation follows. Pleural effusions, massive cardiac hypertrophy, and diaphragmatic hernias, as well as the shortening of the thoracic cage which almost always accompanies anencephalus, not only cause a limitation in the size of the lungs, but in the degree of alveolar development. In fact, this has been cited by other investigators as proof that exchange of amniotic fluid is necessary for normal development, and the disproportionate immaturity is ascribed to forced inactivity of the lungs.

In my series of anencephalic monsters, the lungs from 47 show an average size only half to two-thirds that of normal infants of the same weight. Since the brain and calvarium are absent, the discrepancy is even greater than is indicated, for the body must be proportionately more mature in order to attain an equivalent weight.

In addition to the fact that the fetal anomaly may in itself be expected to alter the appearance of the lung, there is the further difference due to immaturity per se. Most organs at seven months' gestation, which is the age given by the essayist for one of his specimens, are very different from those at term. At this stage the liver shows marked erythropoiesis, the kidney has a wide nephrogenic zone and is actively producing glomeruli, and in the lung alveolar growth is in its early stages. The pattern in the lung as in the other organs, shows many changes between seven lunar months and ten lunar months.

There is insufficient time to describe the normal development of the lung, but suffice it to say that, in a fetus free of any visceral or skeletal anomaly, the lungs show constantly increasing differentiation and elaboration up to the time of birth, that as the pulmonary tree becomes more complex a lumen is normally present in all portions and opposing walls are not in contact, and that at thirty-eight weeks' gestation the alveoli are never lined by a continuous layer of cuboidal epithelium.

There is as yet no conclusive proof that the fluid normally present within the lungs is aspirated from the amniotic sac or is in any way related to pulmonary development. The fact that alveolar development has been shown to be normal, and that alveolar ducts and alveoli are not collapsed in portions of lungs which are completely devoid of communication with the pharynx indicates that the presence of amniotic fluid is not necessary for normal growth.

If, however, the absence of cuboidal epithelium lining the alveoli and the presence of lumens in the alveoli is evidence of asphyxiation, this discussant has never seen a nonasphyxiated stillborn fetus among almost three thousand whose lungs have been examined histologically.

DR. ZETTELMAN (Closing).—The weight of the brain and the missing calvarium in each of the cases which I reported would be about 400 grams, perhaps a little more. That, with the weight of the rest of the body in each case, would be well over 2,000 grams. I would like to say that we considered the lung of the anencephalic fetus not only normal, but, if it were in an infant that was average size, it would be considered practically normal.

NEOPLASMS IN APPARENTLY NORMAL OVARIES

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THE object of this paper is to emphasize the possible occurrence of neoplasms in apparently normal ovaries and to show that some of them can be detected at operation. We have examined the ovaries at all operations in which this was possible in the service of the Graduate Hospital, and in the past three years the following tumors were found in approximately 1,500 ovaries that appeared normal: three dermoids, one Brenner tumor, one fibroma, one papillary cyst adenocarcinoma, and one granulosa-cell tumor. Two of these tumors were discovered in the routine pathologic examination of ovaries removed at operation, five of them were found by examination of the ovary during the operation. These small neoplasms ranged in size from a few millimeters to 1.5 centimeters; none of the ovaries that harbored them were of more than normal size. This comprises a group of tumors of extreme interest in themselves, but a more important consideration lies in the practical aspect of the problem presented by their presence in apparently normal ovaries. Though they were mere infant growths when discovered, such tumors eventually would have enlarged, but their early discovery and removal averted serious consequences.

Microphotographs of the tumors and brief histories are herewith presented.

Case Reports

CASE 1.—Dermoid cyst. (Fig. 1.) Mrs. E. K. J., aged 37 years, was admitted to the hospital because of pain in the lower abdomen for the past two years. Preoperative diagnosis was ovarian cyst. A hysterectomy and bilateral salpingo-oophorectomy was done. One ovary contained a dermoid 9 cm. in diameter. The apparently normal ovary measured 4 by 3 by 2 cm.; it contained a dermoid 1.5 cm. in diameter.

CASE 2.—Dermoid cyst. (Fig. 2.) Mrs. A. B., aged 30 years, was admitted because of low abdominal pain and dysmenorrhea. Preoperative diagnosis was dermoid cyst. Partial left oophorectomy and right oophorectomy was done. She had a dermoid cyst of the right ovary which measured 10 by 7 by 5 cm. The apparently normal ovary measured 3.5 by 2 by 1.5 cm. grossly, while the dermoid in it was only 0.5 cm. in diameter. This cyst was resected, thus leaving a good ovary on the left side.

CASE 3.—Dermoid cyst. (Fig. 3.) Mrs. S. L., aged 62 years, was admitted because of menometrorrhagia for three years. Preoperative diagnosis was multinodular fibroid uterus. Hysterectomy and bilateral removal of tubes and ovaries was done. She had a large Brenner tumor of one ovary measuring 16.5 by 14 by 10 cm. The apparently normal ovary measured 2.3 by 1.6 by 1.3 cm., and contained a dermoid that measured 0.5 by 1.2 cm.

This small ovary offered no problem because of the patient's age, 62 years, but in a younger woman it might have been allowed to remain unless carefully examined on the table, since it could have been easily mistaken for a small hypoplastic ovary.

CASE 4.—Brenner tumor. (Fig. 4.) Mrs. E. H., aged 35 years, was admitted and operated upon because a mass (fibroid) was found in a routine examination which gave no symptoms. Preoperative diagnosis was fibroid of the uterus. Hysterectomy and salpingo-

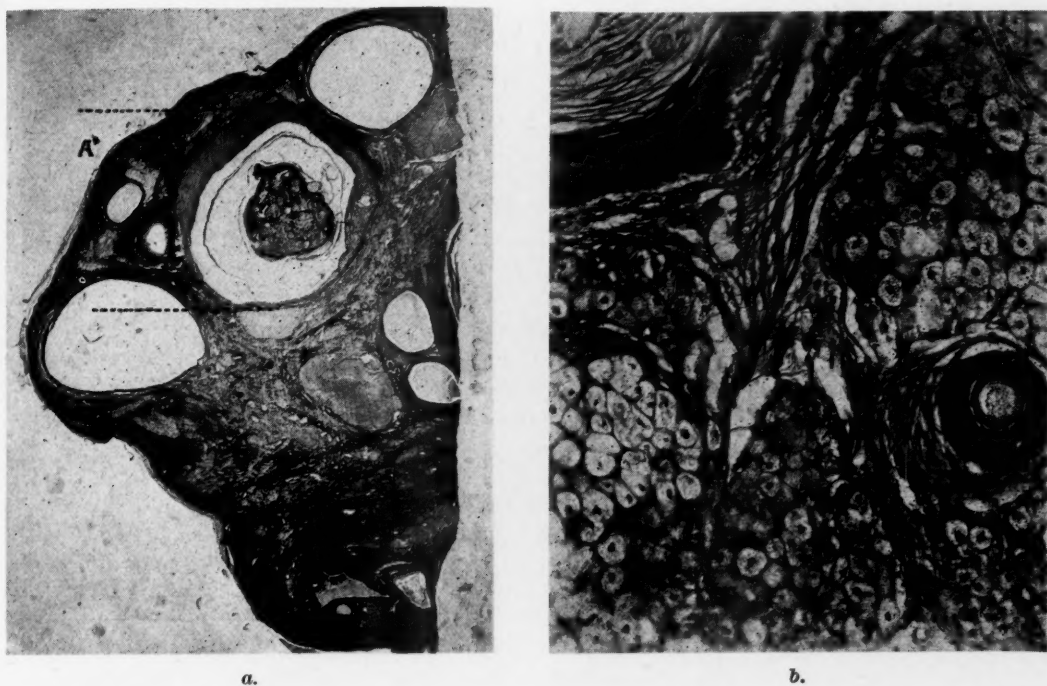


Fig. 1.—*a*, *A'* = low power of a dermoid 1.5 cm. in diameter in an ovary measuring 4 by 3 by 2 cm. *b*, High power of a portion of the dermoid showing squamous epithelium, sebaceous glands and a hair follicle.

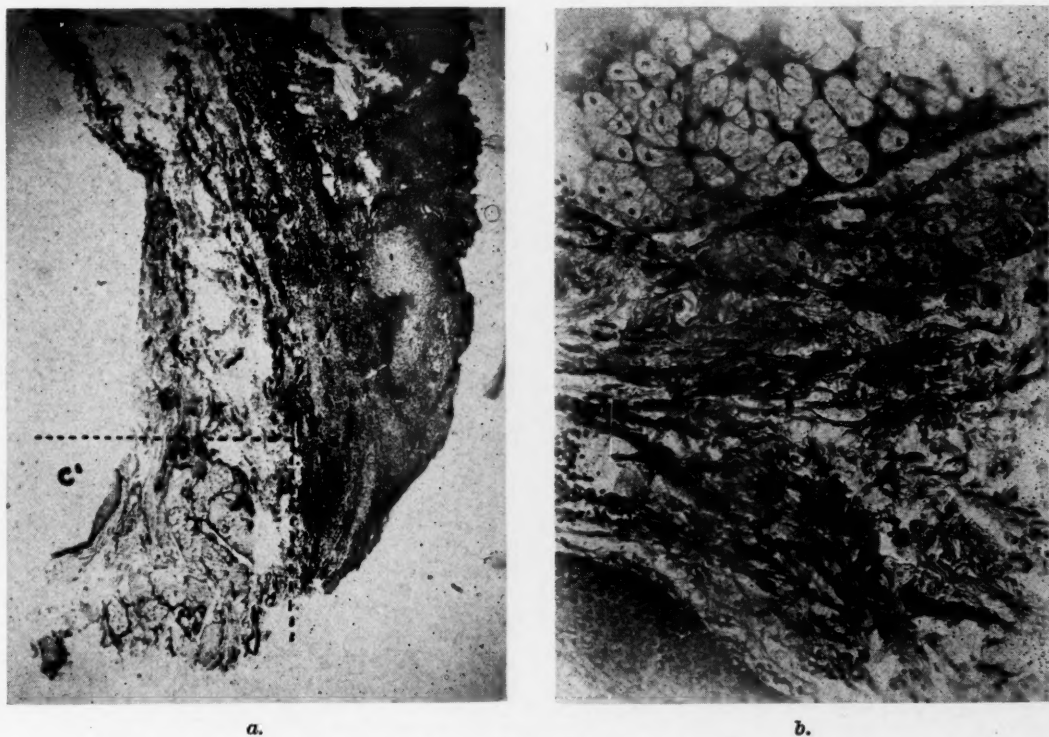


Fig. 2.—*a*, *C'* = low power of a dermoid 0.5 cm. in diameter in an ovary measuring 3.5 by 2 by 1.5 cm. *b*, High power of the dermoid showing sebaceous glands and squamous epithelium.

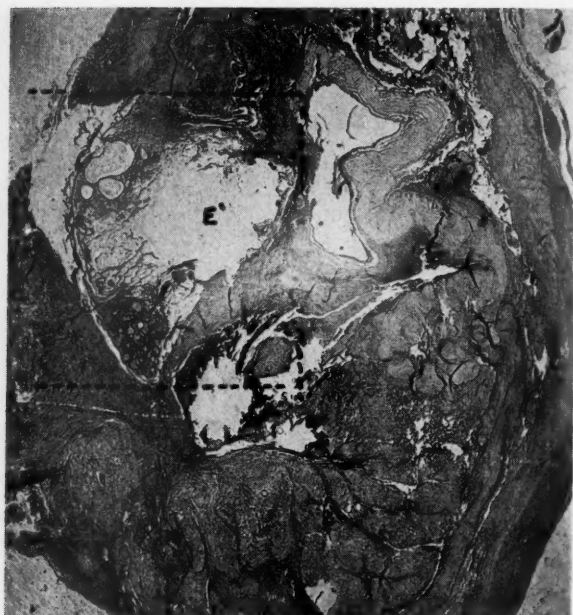
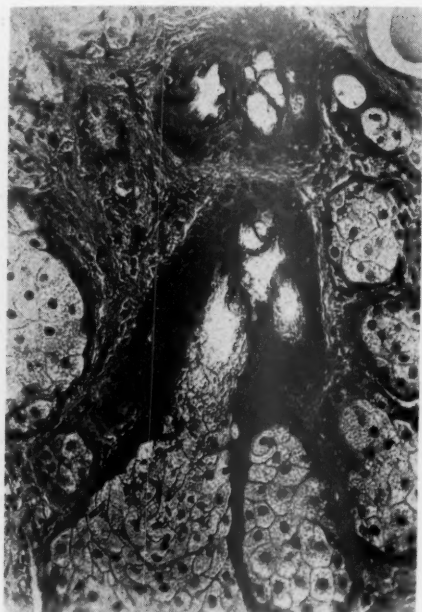
*a.**b.*

Fig. 3.—*a*, *E'* = low power of a dermoid measuring 0.5 by 1.2 cm. in an ovary measuring 2.3 by 1.6 by 1.3 cm. *b*, High power of the dermoid showing squamous epithelium and sebaceous glands. It also contained hair follicles, sweat glands, columnar epithelium of intestinal origin, and a nodule of bone.

*a.**b.*

Fig. 4.—*a*, *G'* = low power of a Brenner tumor measuring 1 by 0.75 cm. in an ovary measuring 4.5 by 3.5 by 2 cm. *b*, High power of the Brenner tumor showing one of the islands of epithelioid cells surrounded by connective tissue stroma.

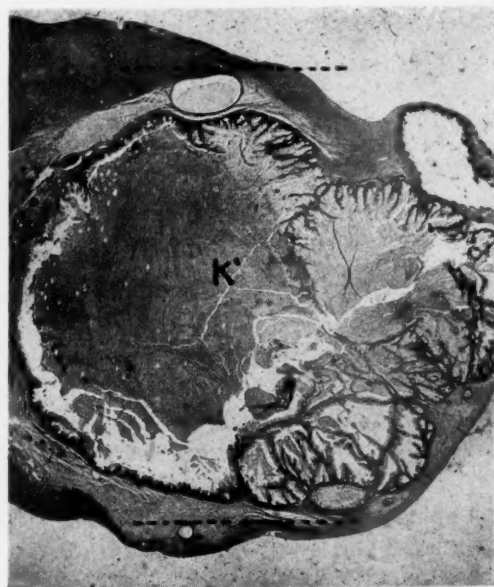


a.



b.

Fig. 5.—*a*, I' = low power of a fibroma measuring 1 by 1.5 by 1.7 cm. situated at the end of an ovary that measured 3.5 by 2.3 by 2 cm. (only small piece of ovary seen in micro-photo). *b*, High power of the fibroma.



a.



b.

Fig. 6.—*a*, K' = low power of a papillary cyst adenocarcinoma of the pseudomucinous type measuring 1.7 by 1.2 by 1.4 cm. in an ovary that measured 4 by 2.5 by 1.5 cm. *b*, High power of a portion of the malignant cyst.

oophorectomy was done. One tube and ovary had been removed at a previous operation. She had a fibroid of the uterus, and an ovary that measured 4.5 by 3.5 by 2 cm., with a Brenner tumor at one pole that measured 1 by 0.75 cm.

This ovary was removed because of its microcystic character and the nodule at one pole; resection would have left practically no ovary.

CASE 5.—Fibroma. (Fig. 5.) Mrs. M. D., aged 35 years, was admitted with the chief complaint of leucorrhea and low abdominal pain. Preoperative diagnosis was cervicitis and retroflexion of uterus. A dilatation and curettage, repair of the cervix and suspension of the uterus, and left oophorectomy was performed. This normal-sized ovary measured 3.5 by 2.3 by 2 cm.; it was removed because of a fibroma that measured 1 by 1.5 by 1.7 cm.

CASE 6.—Pseudomucinous papillary cyst adenocarcinoma. (Fig. 6.) Mrs. E. P., aged 64 years, was operated upon because of a pelvic mass found during a periodic examination. Preoperative diagnosis was carcinoma of the ovaries. She had a hysterectomy and bilateral removal. The large mass felt at pelvic examination was a large malignant papillary cyst. The apparently normal ovary which measured 4 by 2.5 by 1.5 cm. contained a small malignant cyst which measured 1.7 by 1.2 by 1.4 cm.

This patient had a cancer of the hepatic flexure four months previously for which she had a resection, at which time there was no evidence of ovarian malignancy. More than this, no evidence of ovarian enlargement was noted until very shortly before this operation for ovarian carcinoma, in spite of frequent examinations by a competent gynecologist. This case emphasizes the rapidity of growth of ovarian cancers. We have records of three other similar cases of rapid growth in which unfortunately periodic examinations revealed no enlargement until shortly before operation.

CASE 7.—Granulosa-cell tumor, folliculoid type. (Fig. 7.) Miss C. L., aged 23 years, was admitted because of vaginal bleeding. She had had two previous admissions, once when 14 years old, and again when 22 years of age, for vaginal bleeding. Dilatation and curettage was done each time, after which she was discharged with the diagnosis of functional bleeding. Preoperative diagnosis on the present admission was a pedunculated fibroid or ovarian tumor. The operation done was a dilatation and curettage, partial left salpingectomy, and a right salpingo-oophorectomy. This patient had a bilateral chronic salpingitis and a granulosa-cell tumor 3 mm. in diameter in a normal-sized ovary that measured 2.5 by 1.5 by 1.3 cm.

This case is extremely interesting because of the occurrence of a granulosa-cell tumor in a normal-sized ovary and the associated symptom of vaginal bleeding, intermittent, since her menarche. The patient has been followed since the operation four years ago and gives no indication of any further menstrual disturbance.

That not infrequently tumors in apparently normal ovaries can be detected at operation, as shown by this presentation, is important because it is an addition to our meager armamentarium in the effort to improve our results in the prevention of gross ovarian disease. If every surgeon carefully examined every ovary at every operation in which this is feasible, a certain number of very early neoplasms would be discovered that would otherwise be missed. As an example we can cite our own observations in our gynecologic clinic at the Graduate Hospital of the University of Pennsylvania in the past three years, in which seven tumors were found in ovaries that appeared normal. That this number of cases was found in one hospital, in fact in the gynecologic clinic alone, should emphasize the potentiality of this observation when we take into account the great numbers of clinics in this country.

Routine examination of ovaries in abdominal operations is performed inadequately in most instances. Examination of the apparently normal ovaries

should include inspection and careful palpation for areas of abnormal consistency, and if necessary aspiration with a needle. Even incision may be done, as it will do no harm in a suspicious case and may save future embarrassment. The routine puncturing of small follicle cysts for the purpose of diagnosis is to be recommended; an occasional neoplasm will be discovered by this procedure.

Special attention should be given to the examination of the apparently sound ovary in patients operated upon for unilateral ovarian growths. This is important because of the bilateral tendencies of many tumors; in such cases the apparently normal organ is more apt to harbor a small neoplasm that gives no obvious evidence of its presence at the time of operation.

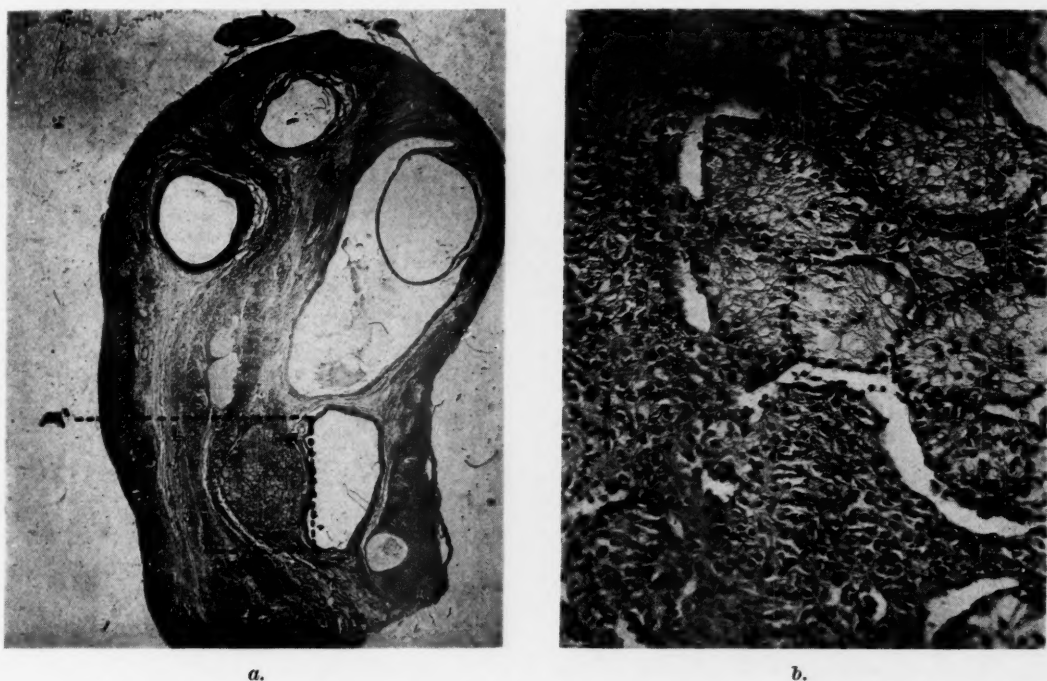


Fig. 7.—*a*, $M' =$ low power of a node 3 mm. in diameter of granulosa cells in an ovary that measured 2.5 by 1.5 by 1.3 cm. (other collections of granulosa cells here and there). *b*, High power showing the granulosa cells. They are largely swollen and clear due to lipid deposition. The folliculoid arrangement of the cells can be seen.

If a minute growth is discovered in a normal-sized ovary during the course of an operation, and it is deep-seated and its nature is questionable, removal of the entire ovary is indicated because tumors of a malignant nature are more apt to be deep-seated. However, complete removal of an ovary is often unnecessary. Ovarian fragments can often be conserved, especially when the lesions encountered are simple cysts or dermoids. As a rule the tissue near the hilus is found to be normal and its blood supply adequate. Even if the circulation of the ovarian fragment is somewhat impaired, it may later become vascularized. In conserving an ovarian fragment one should be sure to remove the entire tumor, and care should be taken in suturing the ovarian remnant, for if there is great vascular damage from the suturing, retention cysts may result.

Summary and Conclusions

That some of the tumors which occur in apparently normal ovaries can be detected at operation is shown by our presentation of seven cases of neoplasms in ovaries that were of normal size. These tumors were found in the past three years in one clinic (Gynecological Clinic of the Graduate Hospital of the University of Pennsylvania); if the many clinics in this country in which abdominal operations are done made a special effort to examine all normal-sized ovaries with extreme care, which means inspection, palpation, puncture, and even incision of the ovary if necessary, our percentage of positive findings of pathology in normal size ovaries would be equalled if not exceeded.

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1930 CHESTNUT STREET

THECA-CELL CYSTOMA OF OVARY

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IN THE past several years an ever increasing number of theca-cell tumors of the ovary have been recorded in the literature, all of essentially similar character. They have been properly designated as solid estrin-producing neoplasms having the appearance of fibromas. Small cystic areas have been observed in a few instances (Novak, McGoldrick and Lapp). The cyst formation in the latter few cases were attributed to liquefaction necrosis of the neoplastic tissues. In the past six years, however, of a total of ten theca-cell tumors observed at New York City and Lincoln Hospitals, two cases were studied which warranted their designation as theca-cell cystomas. In both instances cyst proliferation was noted.

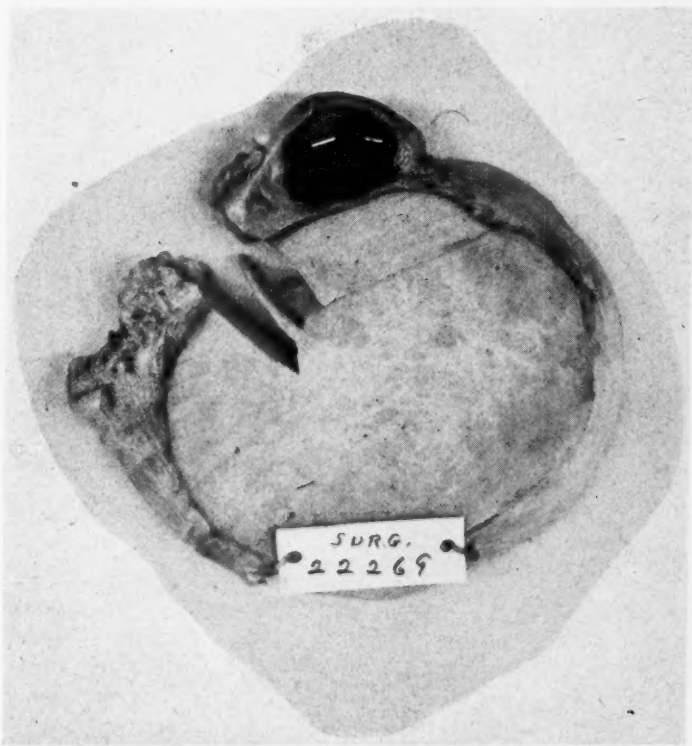


Fig. 1.—Case 1. Cross section of ovarian tumor illustrating its solid fibrous gross appearance.

Case Reports

CASE 1.—S. K., a 30-year-old Negro woman, was admitted to the Gynecological Division, New York City Hospital, June 17, 1941, with the chief complaint of sharp, cramplike pains in the lower abdomen for three years prior to admission. During the same period, there occurred occasional episodes of dizziness, and a "pulling down" sensation in the lower abdomen three or four days before menstruation. There was an additional complaint of frequent nocturia. The gynecologic history revealed the onset of menstruation at 14 years

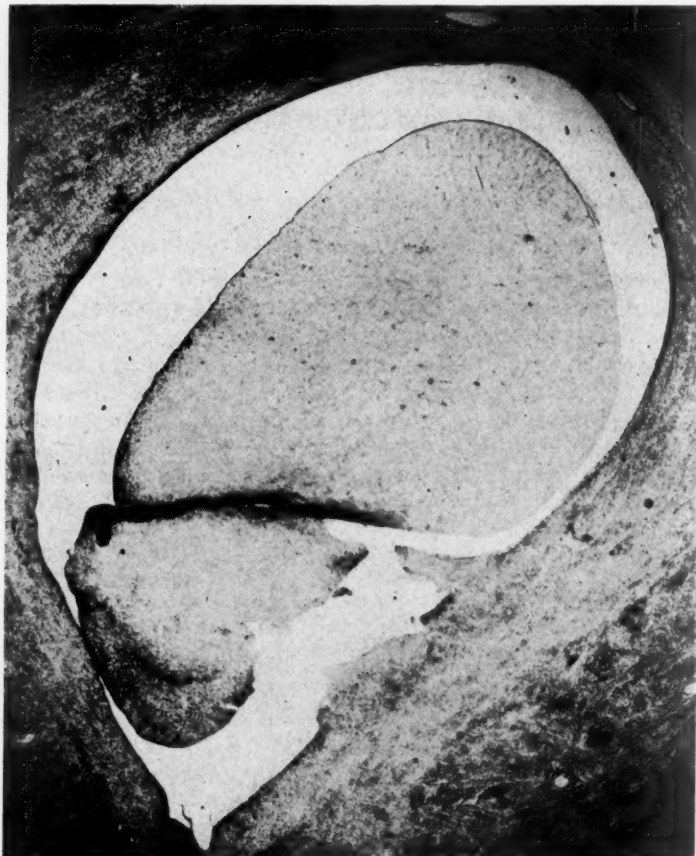


Fig. 2.—Case 1. Microsummar photograph of cyst cavity.

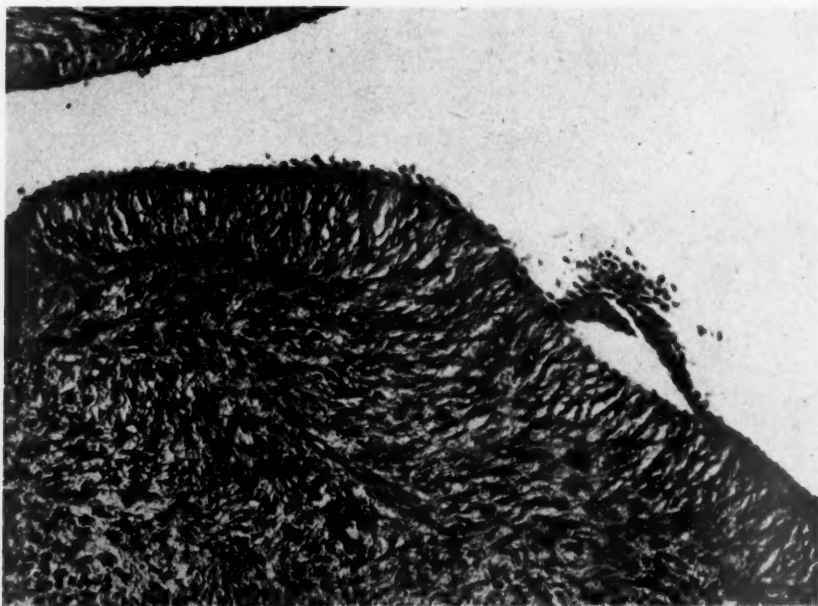


Fig. 3.—Case 1. High-power photograph of granulosa-cell lining of cyst cavity, and the theca-cell stroma.

of age, with regular 30-day intervals, of three to four days' duration. The patient was a gravida ii, para ii. For six months prior to hospital admission, menstruation had become irregular and prolonged, occurring every 22 to 26 days and lasting five to six days.

Physical examination revealed the patient well developed and well nourished. The blood pressure was within normal limits. A vague mass was palpable in the right lower quadrant of the abdomen. Vaginal examination revealed the uterus retroverted, somewhat enlarged, and irregular. A firm, large mass was palpated in the right adnexa. The mass was thought to be a pedunculated uterine leiomyoma.

Laboratory examinations were essentially normal.

Laparotomy performed six days after admission disclosed a large, firm, right ovarian mass, which was excised. The patient made an uneventful recovery and was discharged from the hospital on July 4, 1941.

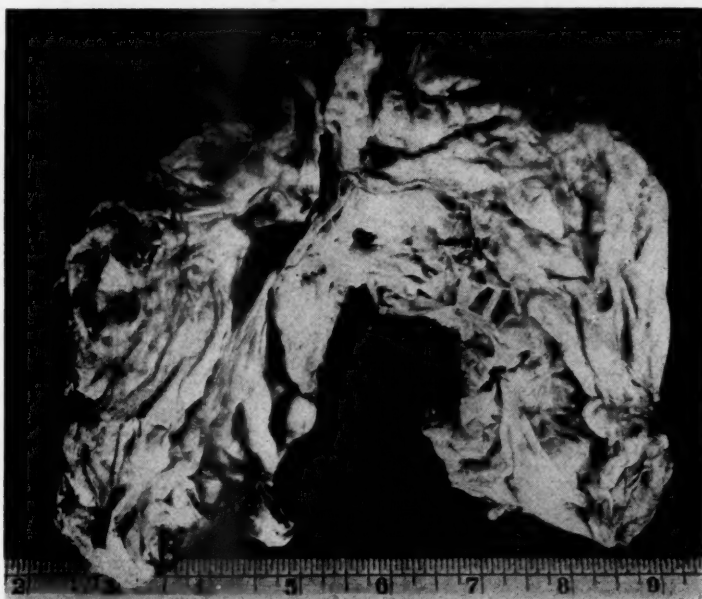


Fig. 4.—Case 2. Gross specimen photograph illustrating the large and small cyst cavities, and the irregular solid neoplastic areas.

Pathology.—The gross specimen was that of a markedly enlarged ovary measuring 7 by 7 by 6 cm. Several small, thin-walled, translucent cysts were noted in the cortical zone of normal ovarian tissue. On section, a well-circumscribed, round, firm mass measuring 7 cm. in diameter comprised the greatest part of the specimen. The cut surface presented a dense, fibrous appearance, with several irregular, pale yellow areas interspersed in the fibrous tissue.

Microscopic examination disclosed the mass well-demarcated from a thin zone of normal ovarian tissue. The latter contained several simple follicular cysts which were visible in the gross specimen. The tumor mass was composed of densely packed, large, spindle- or oval-shaped cells of fibroblastic appearance, in an irregular, interlacing pattern. A moderate-sized, cystic area was noted within the neoplastic mass. The cyst cavity contained a papillomatous structure, whose stroma had a myxomatous appearance. The entire cyst was lined by flattened cuboidal epithelial cells. Similar cells in a single layer covered the papillomatous structure.

Sections stained by the Hoerr-Romeis technique as recommended by Traut and associates for the demonstration of inter- and intracellular estrogenic phospholipids gave a positive result. Silver stains revealed an abundant reticulum.

The final diagnosis was theca-cell cystoma.

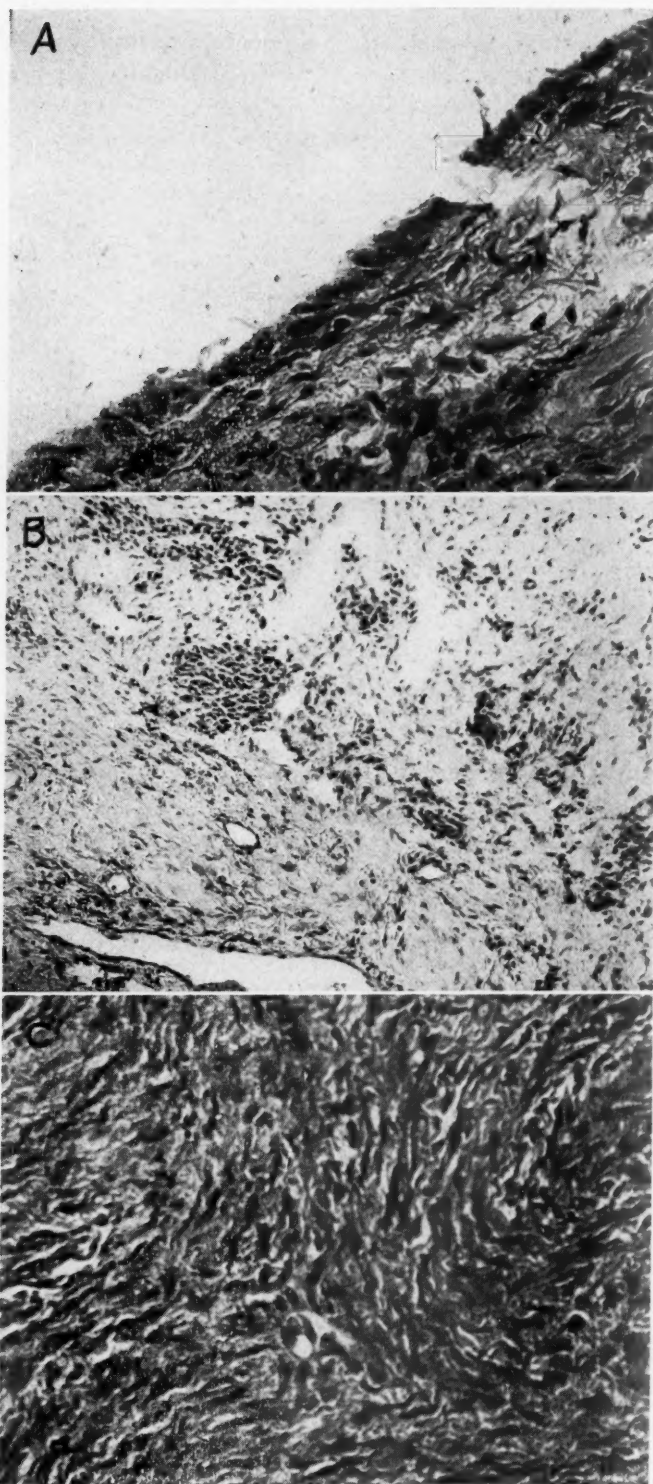


Fig. 5.—Case 2. *A*, High-power view of cells lining the cyst cavities; *B*, low-power view of granulosa-cell nests; *C*, high-power view of theca-cell stroma in the irregular solid areas.

CASE 2.—S. L., a 59-year-old Negro woman, was admitted to the Gynecological Division, New York City Hospital, on Mar. 17, 1942, with the chief complaint of progressive abdominal enlargement of one year's duration. The patient stated that since first noticing the abdominal distention, the abdomen had markedly increased in size. There had been occasional sharp, "pulling" pain when doing housework. Marked urinary frequency was also noted.

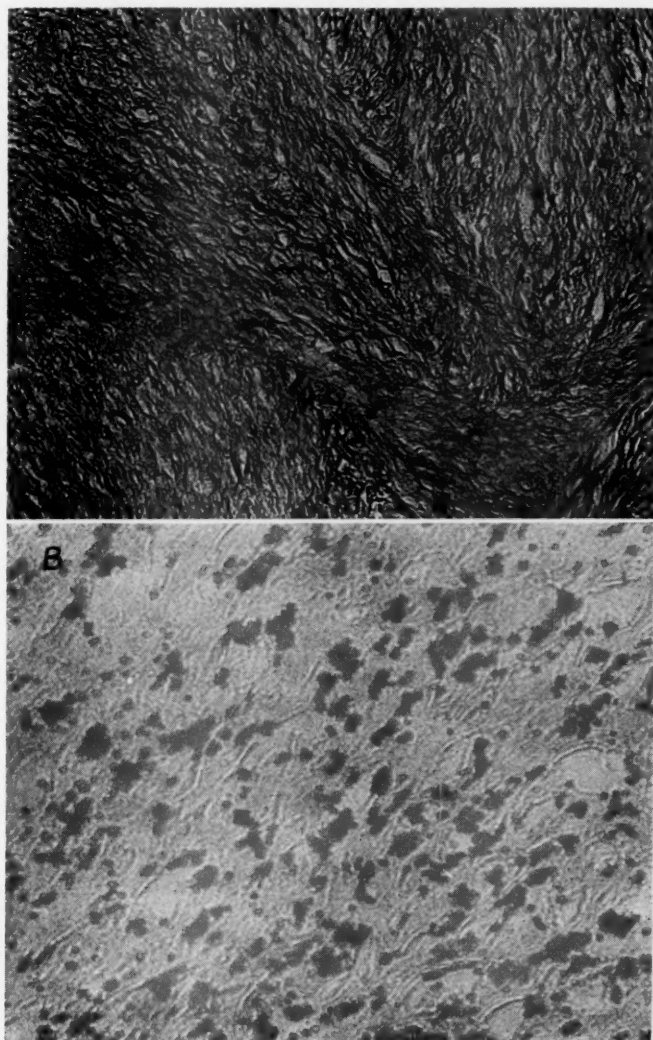


Fig. 6.—A, Representative section, silver stained, demonstrating reticulum; high power. B, Representative section, Hoerr-Romels stain, demonstrating phospholipids; high power.

The gynecologic history revealed the onset of menstruation at 13 years of age, at regular 28-day intervals, and of four to five days' duration. The patient was a gravida vi, para vi, last gravid thirty years before. Menstruation ceased at 48 years of age. One year later, slight vaginal bleeding recurred at regular 28-day intervals, lasting four to five days. This continued for eight years when the bleeding episodes became prolonged and more profuse. For six weeks prior to admission, "spotting" was noted every day.

Physical examination revealed the patient well developed, and well nourished. The abdomen was uniformly enlarged to the size of a six months' gestation. A large cystic non-

tender mass was palpable to just above the umbilicus. On vaginal examination, blood was visible coming from the cervical os. The uterus was enlarged and could be palpated independently of the abdominal mass.

A preoperative diagnosis of possible pseudomucinous cystadenoma of the ovary was made. Laparotomy performed on March 27, 1942, revealed the uterus enlarged to the size of a three months' gestation, with several pedunculated masses arising from it. The Fallopian tubes were of normal appearance. The left ovary was enlarged to the size of a six months' gestation. The mass was cystic with a smooth opaque outer surface, adherent to the sigmoid colon and the uterus. In order to remove the mass, it was incised and its thin pale yellow fluid contents aspirated. Numerous large and small cyst locules were then encountered. A panhysterectomy was performed. There followed an uneventful recovery, and the patient was discharged on July 4, 1942.

Pathology.—The gross specimen consisted of a large nodular uterus, both normal-appearing Fallopian tubes, and a small, right ovary. A large cystic mass was noted arising from the left adnexa, firmly adherent to the left lateral aspect of the uterus. The uterine and cystic masses together measured 21 by 17 by 8 cm. The nodular uterus was enlarged. On section, several intramural myomata were noted, the largest measured 4 cm. in diameter. The endometrium was markedly thickened.

The thick-walled cystic mass measured 17 cm. in its greatest diameter. On section, the mass was multilocular. There were several large cyst cavities and many small thin-walled cysts giving a honeycombed appearance. The cavities contained a thin yellow fluid. Several large irregular, dense fibrous areas of pale yellow color were noted in the outer cyst wall.

Microscopic examination of sections of the cyst revealed the dense fibrous areas formed of closely packed spindle-shaped cells of fibroblastic appearance. The thin septa of the many small cyst locules were formed of similar cells. Lining epithelial cells were noted in several small areas only. These for the most part were cuboidal in shape with oval-shaped pyknotic nuclei. Few small, solid nests of granulosa-like cells were noted in the extensive fibrous areas. Stains for phospholipids were positive. Foot silver stains revealed an abundant fine reticulum.

Sections of the uterus revealed in addition to the leiomyomas, a typical "Swiss cheese" hyperplasia of the endometrium.

Sections of the Fallopian tubes revealed a marked hyperplasia of the epithelium. Sections of the right ovary revealed a small, well-circumscribed fibroma. Phospholipid stains in the latter were negative.

The final diagnosis was theca-cell cystoma.

Discussion

The observation of true cyst formation in two instances in tumors heretofore described as purely solid tumors lends support to the theory endorsed by Novak and Traut and others that the feminizing tumors of the ovary develop from early undifferentiated ovarian mesenchyme. In both instances recorded above, the lining epithelial cells of the cyst cavities were in appearance strongly suggestive of granulosa cells. Thus both granulosa- and theca-cell elements, fairly well differentiated as such, were present. In addition, Case 2 disclosed small, irregular nests of granulosa-like cells in the dense theca-cell stroma, an observation also made by Traut and associates, in a few instances in their series of cases. It is likely, therefore, that these granulosa-cell nests were the underlying cause for cyst formation in these tumors. The probability exists that cyst proliferation depends merely on the degree of differentiation of the granulosa cells.

Furthermore, special attention is called to the fact that as in Case 2, the cystoma may reach such large size as to be readily confused with other ovarian cystomas.

Summary

1. Two cases of theca-cell cystoma of the ovary are reported.
2. The observation of cyst proliferation in this type of tumor, heretofore only reported as solid tumors, lends support to the theory advanced that these tumors arise from early ovarian mesenchyme.
3. Attention is hereby called to the fact that these tumors may reach such large proportions as to be readily confused with other ovarian cystomas.

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GRANULOSA-CELL TUMOR WITH PREGNANCY FOLLOWING REMOVAL

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THE granulosa-cell tumor seems to possess some elusive interest and appeal shared by none other of the ovarian family. This is due to its ability to reawaken the attributes of youthful femininity by fanning into flame the dying embers of the sex gland of the postmenopausal female.

Rare though the granulosa-cell tumor may be, still more remote is mention of the occurrence of pregnancy following its removal. The literature records only three such cases, to which a fourth is now added.

The granulosa-cell tumor makes up about 2 to 3 per cent of all solid ovarian tumors, (Schröder). It appears most commonly in women about the menopausal age. Occasional examples are seen in younger women between puberty and the menopause, while a few have been found in children.

The clinical history of patients having one of these tumors depends primarily upon the fact that they possess endocrine activity, while mechanical and circulatory disturbances and occasional malignancy are accessory factors. The hypersecretion of estrin produces a characteristic syndrome associated with hyperplasia of the endometrium, irregular uterine bleeding, and gradual symmetrical hypertrophy of the musculature of the uterus.

In infancy and childhood the tumor usually produces precocious puberal phenomena with the onset of menstruation. With the removal of the tumor these symptoms retrogress completely, a crucial demonstration of the causative role of the tumor hormones in their production. (Indeed, in at least one recorded case in which such regression occurred, a second reappearance of the precocious symptoms was found due to a recurrence of the tumor in the other ovary. Removal of the recurrent growth was followed by a disappearance of the abnormal symptoms.)

After the menopause there is a recurrence of a more or less regular type of uterine bleeding, enlargement of the atrophic uterus, and occasionally a recrudescence of sex desire. Infrequently, breast atrophy is replaced by transitory hyperplasia. Curettage of the uterus reveals a cystic glandular hyperplasia of the endometrium in the majority of patients; however, a few instances have been seen in which the premenstrual or secretory type of endometrium was seen, even in women of advanced age.

During the period of sexual activity, the symptomatology due to the endocrinal potencies of the tumor is less noticeable because of the proximity of normal menstrual function and also because the other ovary, which is often normal, may serve to mask the picture. However, there is usually a period of amenorrhea followed by menorrhagia or metrorrhagia, or there may be simple irregularity of the menses.

In the amenorrheic stage, there may also be an associated hirsutism, male type of escutcheon and beard. Severinghaus¹ states "that in its ovarian aspects menstrual rhythm may be disturbed by alteration in the duration or intensity of follicular or luteal secretory activity."

If the tumor is benign, its removal served to re-establish the former stature of the patient, thus giving clinical proof of its endocrinal activity, except that in those prepubertal cases where the menarche is imminent, the individual may continue sexual development with more or less normal periodicity of the menstrual function.

Approximately 80 per cent of the granulosa-cell tumors are clinically benign. When malignant, they metastasize rapidly and produce death in a short time. P. J. Kearns² states that in his opinion, less than 5 per cent of granulosa-cell tumors are malignant.

It may be generally stated that while both granulosa-cell carcinoma and arrhenoblastoma are undoubtedly much less malignant than more common types of ovarian carcinoma, they must always be looked upon as potentially malignant, and in many cases the degree of clinical malignancy is high. Moreover, recurrence is sometimes extremely late, after intervals of ten or even eighteen years. Novak³ states that there does not seem sufficient justification for the rather light attitude of some writers toward this type of tumor, especially since histologic criteria have not been found to constitute a reliable index of the degree of malignancy.

When a benign granulosa-cell tumor takes control of the menstrual cycle in a young woman, sterility is to be expected, and this, no doubt, is usually the rule. Dr. Clair Folsome has personally recounted to one of us, however, a case where he found a pregnancy in association with a granulosa-cell tumor.

In this young type of woman, following removal of a benign granulosa-cell tumor, fertility and normal reproductivity should not be unexpected unless both ovaries have been removed. Even so, the literature mentions only three previous cases of this nature.

Klafton⁴ found pregnancy one year after a tumor was removed from a 29-year-old woman. This was followed by ten years of amenorrhea. Then a second tumor of the granulosa-cell type was removed from the opposite ovary.

Countiss⁵ reported a case of a 36-year-old woman who had profuse, almost continuous, menstrual bleeding, followed by amenorrhea. The uterus was enlarged to the size of a six weeks' pregnancy, and a curettage showed a grossly hyperplastic endometrium, while the ovary showed a tumor 4 by 3 by 3 cm. One year following removal of tumor, pregnancy occurred.

Schulze⁶ reported a case of a woman 27 years of age, with five years' sterility. Two years following removal of a granulosa-cell tumor in the ovary, the patient gave birth to a full-term child.

Case Report

The patient, Mrs. D. H., a 35-year-old woman of Anglo-Saxon origin, was admitted to the Women's Pavilion of the Royal Victoria in October, 1943, for excision of a palpable pelvic tumor associated with lower abdominal pains. The previous menstrual history was most unusual. From the menarche at 13 years of age, intermittent amenorrhea was noted, menstruation occurring at intervals of six weeks to six months. Two years after marriage she became pregnant and was delivered of a healthy child. She had only one period four months after delivery. During the next four years the patient complained of amenorrhea, fatigue, and nervousness. She gradually developed a nagging pain in the right lower quadrant and examination revealed a tumor replacing the right ovary. This was observed to grow from the size of a small egg to that of a baseball during the course of a year.

At operation, a solid grayish-white ovarian tumor was found on the right side, while the left appeared healthy. In view of the age of the patient and her desire to rear further offspring, the surgeon (W. R. F.) removed only the diseased organ. Postoperatively the patient menstruated only once before becoming pregnant. It is of interest to note that prior

to the operation the patient was in a very unstable state of mind, appearing restless and irritable, while sexually she had a total absence of libido. Since operation she has recovered from this confused state and sexual desires and relations have been normal.

The pregnancy progressed satisfactorily and she gave birth to a perfectly healthy child. Since delivery the patient has had a normal menstrual cycle of twenty-eight days and has enjoyed her first good health since the onset of puberty.

Pathologic Report.—Grossly, the ovary presents a round firm, grayish-white mass, measuring 7 by 5 cm. The cut surface presents a homogeneous whitish appearance with one small cystic cavity the size of a cherry in its center.

Microscopically, the cortex appears moderately thick, while spreading throughout the whole structure of the ovary are large solid masses of granulosa cells (Figs. 1 and 2). The cortex and hilum alike exhibit intensive infiltration and obliteration by clumps of these immature-appearing epithelial elements. No follicle or glandlike pattern is demonstrable, but numerous Call-Exner bodies are apparent.

Diagnosis.—Granulosa-cell tumor.

Comment

The initial impulse of the pathologist on diagnosing a unilateral ovarian mass as a granulosa-cell tumor is to query the fate of the remaining ovary, and to cast doubt upon the wisdom of the surgeon in leaving it. The subsequent course of the patient in promptly becoming pregnant would unquestionably justify the course followed. Even if a second granulosa-cell tumor should chance to develop in the remaining ovary in later years—and this possibility must always be borne in mind—the patient has meanwhile been rewarded by a normal healthy child which would have been lost if a radical bilateral oöphorectomy had been performed to say nothing of the mental and physical effects which might result from a surgical castration.

An interesting situation arose when the clinician queried the pathologic report of the tumor as a "granulosa-cell carcinoma." There appeared to be ample reason to question whether this should be labeled as a "carcinoma" when the patient was already pregnant and the tumor was clinically, at least, proved to be relatively benign. Indeed, with the subsequent developments in the case, the pathologist considered it wise to redesignate the lesion as a "granulosa-cell tumor."

Long periods of amenorrhea in a so-called "feminizing" tumor where a large amount of secretion of the estrogenic hormone is believed present seem difficult to explain. Dr. J. S. Henry of our clinic is of the opinion that so long as the estrogenic level in the body is on the increase, amenorrhea will ensue. Whenever it becomes stationary or drops, then bleeding will soon follow. In this manner he feels that amenorrhea could persist up to six months or longer. Dr. G. B. Maughan supports the hypothesis that the excess amount of the estrogenic secretion acts upon the pituitary gland, depressing the gonadotropic hormone, resulting in amenorrhea. It is well known that one may knock out normal menstruation perhaps for some months by continuous administration of large doses of stilbestrol or other similar preparations.

It is noteworthy that three out of four of the cases mentioned here make definite mention of a prolonged period of amenorrhea, whereas bleeding is generally considered to be the clinical feature in tumors of this type.

In our case the surgical excision of the tumor was promptly followed by a clinically normal menstruation. It appeared that the removal of the conflicting endocrine force permitted rapid physiologic resumption of the normal sexual cycle, with prompt fertilization resulting in a pregnancy which carried on in a perfectly normal fashion to maturity.

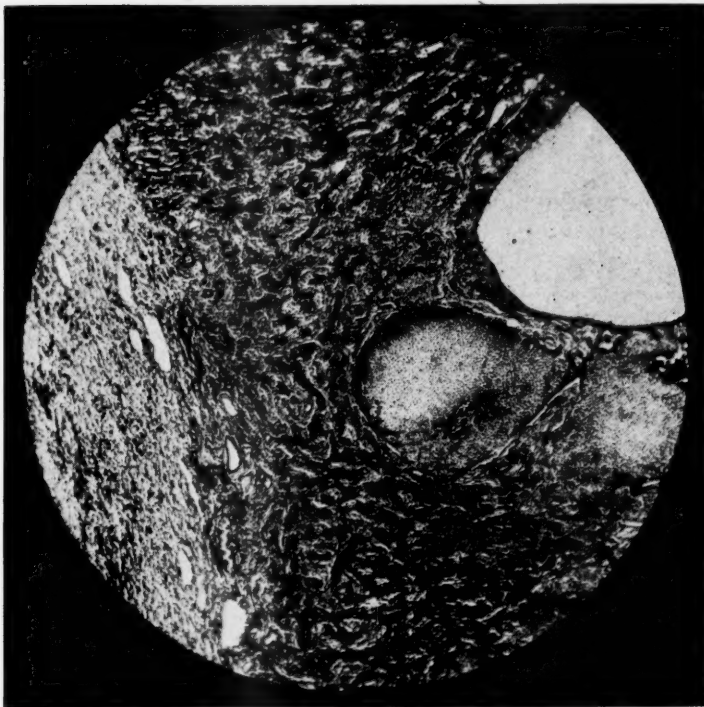


Fig. 1.—Granulosa-cell tumor. Low power taken near cortex. Note solid masses and infiltrating groups of granulosa cells.

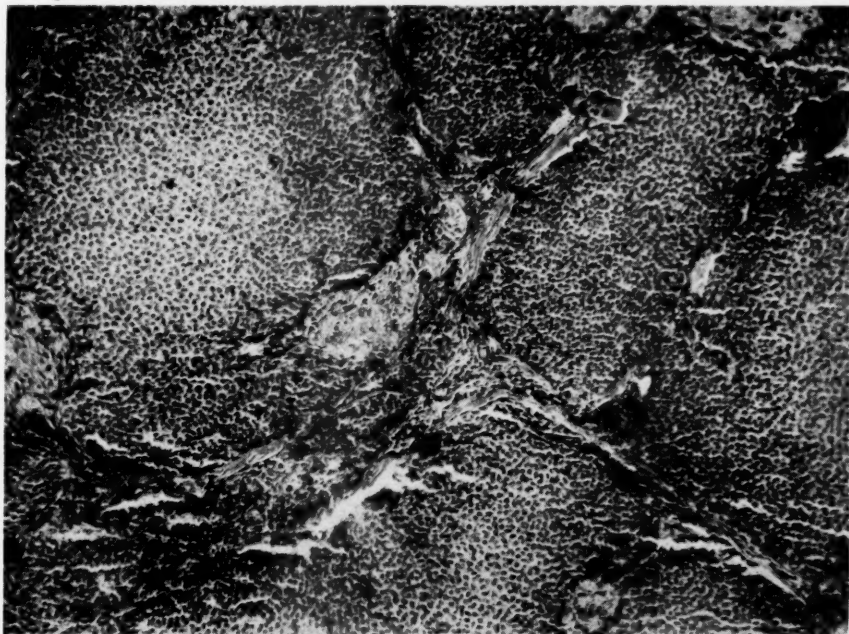


Fig. 2.—High power showing homogeneous appearance of sheets of granulosa cells replacing ovarian structure.

Conclusions

A case has been presented where a granulosa-cell tumor was removed from a young woman, to be followed by a normal pregnancy.

It would appear that conservative surgery is justifiable in sparing the second ovary when free from signs of malignant disease in a woman in the reproductive age.

Amenorrhea would appear to be a common clinical feature of granulosa-cell tumors occurring in a young woman.

The authors wish to acknowledge with thanks the assistance of Dr. Marion Francis in preparing data for this paper.

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AN EARLY OVARIAN PREGNANCY*

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SINCE the possibility of ovarian pregnancy has been recognized, something over seventy cases have been reported. A critical examination might reduce this number somewhat. It is probable that some escape notice, and that the actual number is greater than we may believe. The number of reported cases is still sufficiently small that it is of interest to add to the number.

A woman 30 years of age entered the hospital July 1, 1944, suffering from lower abdominal pain. Her last menstrual period was June 1. She had had no children but had aborted once. Some hours before admission she had sudden cramplike abdominal pain which recurred at intervals. There was no vaginal bleeding. She fainted once about two hours before admission.

On admission she was in fair condition; pulse 100, and leucocytes 12,000. Bimanual examination disclosed a mass on the left side which was quite tender and much smaller than is often found in tubal pregnancy. A diagnosis of ectopic pregnancy was made, and operation carried out at once.

A large amount of blood was found in the abdomen. The left tube was entirely normal. When the fimbriated end was wiped off, no blood was seen coming from it. The left ovary contained a small cystic mass about 3 cm. in diameter. This was entirely free from the tube. The relationship of the ovarian ligament to the ovary and the cystic mass was quite clear and was quite normal. On the surface of the small cyst farthest removed from the ovary was a dark red area from which active bleeding came. This mass was removed from the ovary with little difficulty and the resulting wound closed with sutures of fine catgut. Recovery was uneventful. The adnexa on the right side were entirely normal. The excised mass was placed immediately in Bouin's solution.

Many sections were made through the area from which the bleeding came.†

The greater part of the wall of the cystic mass was made up of corpus luteum cells. The follicle had evidently discharged the ovum a sufficient time before the operation that luteinization had had time to take place. At the area of hemorrhage were found masses of cells which were definitely different from the cells of the greater part of the wall. An area of hemorrhage was seen, around which were groups of large cells with deeply staining nuclei. These cell masses were evidently parts of what had originally been a much larger mass which had been broken up by hemorrhage. These cells we believe to be cells of proliferating trophoblast, largely syncytial cells. Dr. Leslie B. Arey agreed with us that the cells are syncytial in character and that they undoubtedly indicate an early pregnancy.

As the tube was wholly normal, it is evident that the implantation was not a secondary one. The egg, after fertilization, attached itself to the follicle from which it had shortly before escaped. It is possible that the ovum entered the ampulla of the tube and escaped again without implantation in the tube, and that it then attached itself to the ovary. The attachment was to the outer surface of the follicle and the development of the ovum was hindered by the fact that it had attached itself to a surface unfavorable for growth.

As the normal tube was not removed, it is impossible to state whether a decidual reaction was present or not. It is probable that much of the cell mass which existed before the onset of hemorrhage was swept away by the flood of blood. The remaining cells resemble strongly those seen in an embryo of the Rock-Hertig series of about ten to twelve days.

*Presented before a meeting of the Chicago Gynecological Society Dec. 15, 1944.

†Dr. John McCarter, assistant professor of pathology at Northwestern University, and director of the Abbott Memorial Laboratory, devoted much time and skill to the preparation and study of microscopic preparations.



Fig. 1.—Early ovarian pregnancy showing central hemorrhage ($\times 43$).

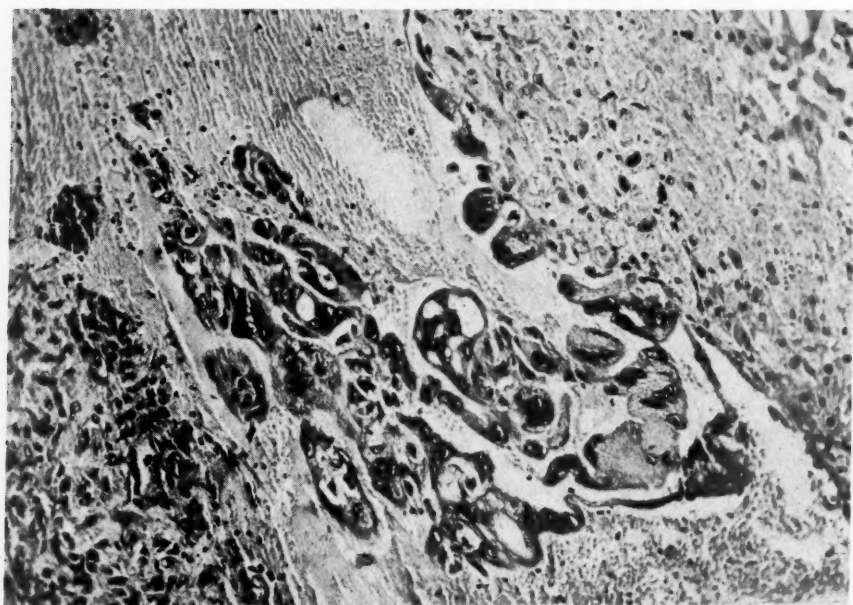


Fig. 2.—Higher magnification showing syncytiotrophoblast ($\times 215$).

While the size of the pregnancy seems smaller than would correspond with the length of time which elapsed between the last period and the date of bleeding, this would seem to be accounted for by the fact that the ovum was trying to grow in an inhospitable field which would cause development to be slower than that of a normally placed ovum. The pregnancy is smaller than any which I have been able to find among the reported cases.

In many of the reported cases the fertilized ovum developed in the cavity of the follicle. Veit has pointed out that the attachment of the ovum is not necessarily within the follicle. In this case it attached itself to the outer surface of the ovum from which it had escaped. The conditions laid down by Spiegelberg for recognition as an ovarian pregnancy are met in this case.

HYDRADENOMA AND HYDRADENOID CARCINOMA OF THE VULVA*

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TUMORS originating in the sweat glands of the vulva are of particular interest. The sweat glands of the vulva include, in addition to the common or eccrine sweat glands, a special group called the apocrine glands. These glands are found in other parts of the body besides the vulva, and they give off an odor which, in lower animals, is often associated with sex scent. In human beings, the apocrine glands are more active during menstruation and pregnancy.

The rarity of tumors of apocrine glands, according to Gates, Warren, and Warvi,¹ is probably due to the fact that they have been included in reports with tumors of the ordinary or eccrine sweat glands. In their report of 94 tumors, there were 8 of apocrine gland origin, and 6 of these were from the vulvar region. The terminology has been further confused since many of these tumors have been considered malignant. McDonald² reported 30 such cases as adenocarcinoma despite the fact that there was no evidence of metastasis in the entire group.

Following the classification of Gates, Warren and Warvi,¹ the benign tumor of apocrine gland origin is called hydradenoma papilliferum, and the malignant tumor is called hydradenoid carcinoma. In this paper an example of each type of tumor is presented.

CASE 1.—Mrs. M. M., a white woman, 34 years of age, was admitted to the hospital in February, 1943, with numerous complaints, none of them referable to a small cystlike structure on the left labium majus midway between the anterior and posterior commissures. This was thought to be a sebaceous cyst, and the patient had been aware of it for over a year. This mass was removed as an incidental procedure during the operation for her major complaints. Grossly it measured 1 cm. across, when incised, and microscopic examination showed it to be a small tumor mass (Fig. 1) composed of two types of epithelium, one a tall columnar pink cell and the other a cuboidal, dark, blue-staining cell (Fig. 2). Both types of cells formed glandular arrangements with papillomatous infoldings. The entire tumor was surrounded by connective tissue and showed no evidence of invasion. Compound granule cells were seen in the lumina of some of the glands. The tumor was located immediately beneath the surface epithelium. A diagnosis of hydradenoma papilliferum of the vulva was made. There has been no recurrence of the tumor up to the present time, twenty-six months later.

CASE 2.—Mrs. A. C., a white woman, 67 years of age, was admitted to the hospital with the complaint of slight vaginal bleeding and purulent discharge for two weeks. Examination showed an ulcerated area overlying the Bartholin gland just within the vaginal introitus on the left. The region underlying the ulcer was indurated but no definite mass could be felt. A small portion of the tissue from the ulcerated area was removed for biopsy. Microscopic examination showed a growth which was rather superficial in places. It was composed of small deep-staining cells which grew in solid sheets and showed distinct evidence of invasion (Figs. 3 and 4). Mitotic figures were numerous but the growth was not pleomorphic. Small areas

*Read before the Pittsburgh Obstetrical and Gynecological Society, April 2, 1945.

resembling attempted pearl formation were seen. A diagnosis of hydradenoid carcinoma of the vulva was made. Following simple fulguration with cautery, the tumor has persisted, but there are no evidences of regional or distant metastases.

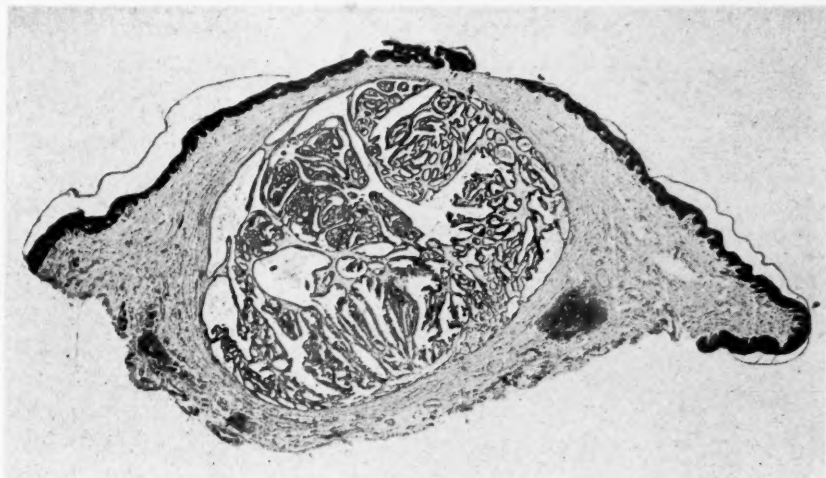


Fig. 1.—Hydradenoma papilliferum ($\times 10$). Note the well-encapsulated tumor just beneath the epithelium. The papillary arrangement of the growth is shown.

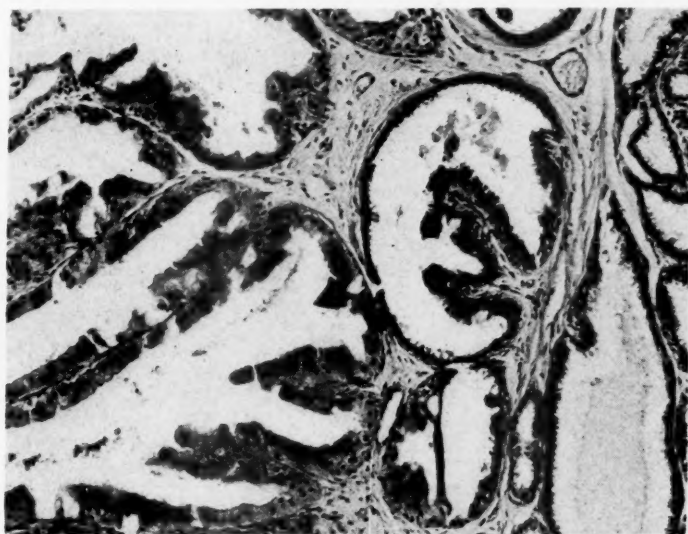


Fig. 2.—Hydradenoma papilliferum ($\times 270$). The cells in the left half of the picture are tall and pink staining with the nuclei toward the center of the cell. The right half of the photograph shows low cuboidal deeply staining cells.

Discussion

According to Novak,³ 40 cases of hydradenoma of the vulva had been reported before 1940. Since then, approximately an equal number of these tumors has been reported.^{1, 2, 4-6} The majority of these were found to be located on the labium majus, or at the fissure between the labia majora and minora. They are nearly always single. Grossly the tumor is usually under 1 cm. in diameter and is considered most often a sebaceous cyst. It is usually buried rather deep under

the skin, but may be pedunculated. These tumors may be of the solid adenomatous type, but are more often papillary in nature. The individual cells are usually of the columnar type. The nuclei are round and commonly lie one-third of the distance up from the basement membrane. The papillary type tumors contain little stroma.

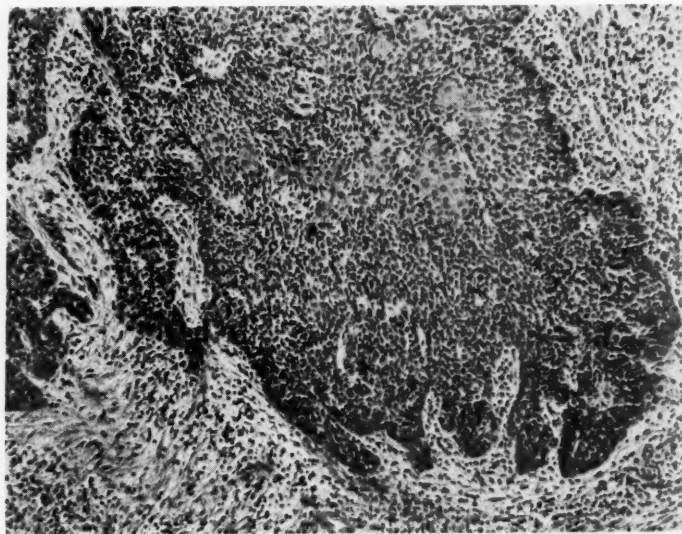


Fig. 3.—Hydradenoid carcinoma ($\times 80$). This is the largest island of tumor found in the excised tissue. Note the invasive tendency of the growth and the pale areas vaguely resembling epithelial pearls.

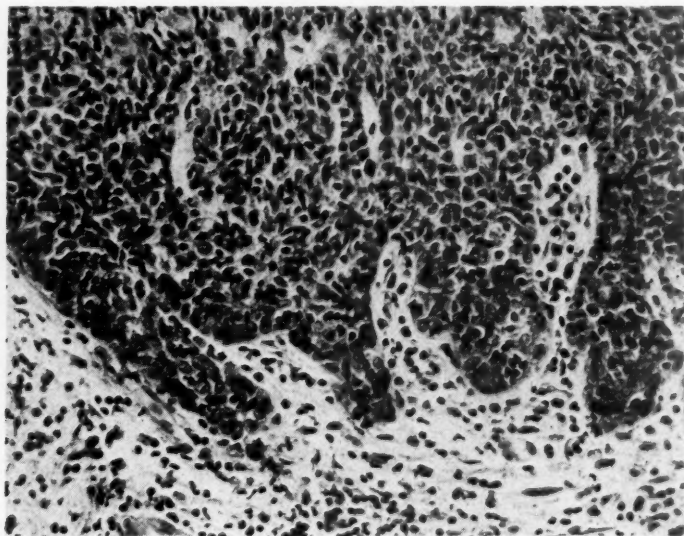


Fig. 4.—Hydradenoid carcinoma ($\times 270$). The cells show little cytoplasm, slight pleomorphism and a few mitotic figures.

The malignant tumor arising in the sweat glands of the vulva is the hydradenoid carcinoma. This tumor is, of course, not confined to the vulva, being seen anywhere on the body surface. Gates, Warren, and Warvi,¹ after reviewing the literature and including six cases of their own, list only 36 hydradenoid car-

cinomas in which the diagnosis is definite. Of these, only five were tumors of the vulva. The information regarding such tumors of the vulva, what little of it is available, is indeed confusing. The writers are only in agreement on the point that these tumors are of low malignancy. The tumor reported in this paper is considered malignant and the diagnosis of hydradenoid carcinoma is made chiefly by exclusion. Despite the presence of areas resembling attempted pearl formation, this is not a keratinizing tumor. Pearl formation has been reported in a few hydradenomas of the vulva.³ Further, atypical pearls have been described in other nonkeratinizing tumors, such as hair matrix carcinoma and adamantinoma.

In the differential diagnosis, extension from the cervix must be considered. In this patient, the cervix was entirely free of tumor. The cells were too small and densely arranged to have originated in Bartholin's glands or from the sebaceous glands. Paget's disease and hair matrix carcinoma must also be thought of, but this tumor fails to show the characteristic histology of either lesion. The location of the tumor just inside the introitus is contrary to the described location of apocrine, or any other type of gland. However, it has been proposed that the hydradenoma at times develops from aberrant glands.⁴ On the other hand, it seems likely that this tumor may have extended to this location from the surface.

Summary

1. Hydradenoma papilliferum and hydradenoid carcinoma have been discussed and an example of each has been presented.
2. These tumors represent the benign and malignant phases of new growths arising in the apocrine glands of the vulva.

Thanks are due to Dr. Joseph A. Hepp and Dr. James Hodgkiss for permission to use the material.

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EXTENSIVE VARIX OF VULVA AND VAGINA IN FULL-TERM PREGNANCY; DELIVERY BY CESAREAN SECTION*

CAPTAIN SAMUEL S. ADLER,† M.C., A.U.S., NEW YORK, N. Y.

ALTHOUGH varicosities of the vulva complicating pregnancy and labor are not uncommon, varix of the vagina alone or in combination with those of the vulva is a rare lesion.¹ Mathieu and Holman² stated that in a combined obstetric experience of thirty-seven years they never encountered a vaginal varix. Such genital varicosities may give rise to considerable hemorrhage should they rupture in the course of labor.^{1, 3, 4, 5} Although DeLee⁶ states that such varicosities may be fatal from internal hemorrhage or from infection with complicating sepsis, the only treatment suggested is immediate suture or firm tamponade.

The European literature on this subject is much more revealing. Salvini's patient⁷ was a multipara, 29 years of age, who suffered rupture of a vaginal varix in the seventh month of her fourth pregnancy. She was sent into the hospital by her local physician with a diagnosis of central placenta previa. Examination demonstrated a ruptured vaginal varix as the source of bleeding, which was then controlled with two catgut sutures, and the patient was delivered spontaneously at term. In his case report Salvini mentioned that he witnessed a delivery in which rupture of a varix took place from the vestibule during delivery of the head and that in spite of the use of mass ligatures the patient died. In Constandulaki's case,⁸ forceps were applied to a vertex in persistent right occiput posterior position five hours after complete dilatation with, to use the words of the author, "a certain amount of apprehension because of great varicosities completely masking the vulva orifice." Following delivery, tremendous vulva bleeding occurred which was controlled by tamponade and hemostats. Frank⁹ mentions Kaufman's citation of a case where air embolism occurred through the site of a ruptured vaginal varix. Pestalozzai, Mahmmacher, Tarnier, and DuBois are cited by Salvini as having reported deaths following rupture of genital varicose veins. Naujoks¹⁰ states that abdominal section is the method of choice when large vulval or vaginal varicosities complicate pregnancy.

The following case is reported for three reasons: (1) To cite the case for the record, (2) To indicate the dangers of vaginal delivery in the presence of extensive genital varices, (3) To emphasize that in the presence of such extensive genital varices treatment of choice is elective cesarean section.

Case Report

A 20-year-old, white woman, married one year, registered at the Pre-Natal Clinic, Regional Hospital, Fort Monmouth, New Jersey, in the fourth month of her first pregnancy. Amenorrhea had been present since Feb. 10, 1943; it was expected that her date of confinement would occur about Nov. 20, 1943. The menstrual periods had always been regular with age of onset at 14 years, moderate five-day flow recurring at 28-day intervals. On physical examination, the patient was found to be well-developed, weight 118 pounds, height, 62 inches, blood pressure 100/62. Positive findings revealed a normal intrauterine gestation of four months' duration. Pelvic mensuration was adequate, gynecoid type. Blood serology test for syphilis was negative, urinalysis normal, erythrocytes numbered 4,750,000 per c.mm. with 90 per cent hemoglobin, leucocytes numbered 8,400 per c.mm. with normal differential.

*Presented at a meeting of the Section of Obstetrics and Gynecology of the New York Academy of Medicine, Jan. 25, 1944.

†Stationed at Rhoads General Hospital, Utica, N. Y.

At a scheduled prenatal visit toward the end of her sixth month, the patient complained of swelling of legs with pain in the left leg and aching in the vagina. Examination of the lower limbs revealed pitting edema and moderately severe varicose veins, more pronounced on the left leg. Vaginal examination demonstrated considerable vulval swelling with extensive bilateral varicosities of the labia majora and minora. Bulging through the vestibule at its lower angle for a distance of 1 cm. was a large, soft, purplish, nontender varicose vein, 2 cm. in diameter, which extended along the right margin of the posterior vaginal floor for a distance of approximately 5 cm. Because of these findings, the patient was instructed to wear an Ace bandage on the left leg, rest moderately during the day, and refrain from any type of exertion and further intercourse. As pregnancy continued, the genital varices in turn became more pronounced and the vaginal varix assumed a port-wine color. Fearing rupture of the genital varices with resultant hemorrhage if she was permitted to go into labor, an elective abdominal cesarean section was selected as the method of delivery. Throughout the entire prenatal period the blood pressure remained within normal limits, the urine was persistently normal, and the weight gain amounted to 27 pounds.

The patient entered the Regional Hospital, Fort Monmouth, New Jersey, on Nov. 10, 1943, for cesarean section. Abdominal examination on admission was as follows: height of fundus, 26 cm.; presentation, vertex; position, right occipitoanterior; fetal heart right lower quadrant. Admission laboratory study revealed a normal urinalysis; red blood cells, 3,400,000 per c.mm.; white blood cells, 11,600; hemoglobin, 66 per cent; blood type, O. On November 12, under ether anesthesia, a low classical abdominal section was performed with delivery of a normal living male infant, weighing 7 pounds, 1 ounce. Since the patient was not in labor and it was desired to complete the operative procedure with a minimum loss of time and blood, the classical method of cesarean operation was employed. The patient was in very satisfactory condition upon her return to bed but to maintain fluid balance 1,000 c.c. of 5 per cent glucose in normal saline was administered by vein. Because of the presence of a moderate secondary anemia, transfusion with 500 c.c. of citrated blood by the indirect method was performed upon recovery from the anesthetic. Other than a mildly severe atelectasis of the base of the left lung which manifested itself on the second and subsided on the fourth postpartum day, convalescence was uneventful until the twelfth day when she was permitted to dangle her legs. Pelvic inspection on that day revealed complete subsidence of the vulval varicosities and edema and considerable reduction in size of the vaginal varix, which appeared pale. That evening, left saphenous phlebitis developed, characterized by pain and fever. Treatment in addition to bed rest consisted of three x-ray exposures to Scarpa's region of the left thigh at three-day intervals, with dosage regulated at 50 roentgens filtered through 3 mm. aluminum. Following the second exposure there was complete freedom from pain and tenderness, and on the 26th postpartum day, fourteen days after the inception of the complicating phlebitis, the patient was discharged from the hospital.

She returned for postnatal examination six weeks after delivery. No varicose veins of the vulva or vagina were noted on examination. The uterus was anterior, nontender, regular in outline, and palpable one fingerbreadth above the symphysis. No adnexal tenderness was present. The abdominal scar was firmly healed, the thigh and legs showed only an occasional fine varicose vein.

Summary

1. A case is reported of a 20-year-old primipara whose pregnancy was complicated by extensive varicosities of the vulva and vagina.
2. The increased hazard of vaginal delivery in such cases is indicated by citation of case reports and references to the literature.
3. The treatment of choice for extensive genital varices complicating pregnancy is elective cesarean section.
4. A complicating postpartum phlebitis of the left saphenous vein was treated by x-ray therapy.

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TOXEMIA OF PREGNANCY WITH UNUSUAL POSTMORTEM FINDINGS

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CASE 1.—C55522, L. B., aged 25 years, a white woman, was admitted to the obstetric service of this hospital on Oct. 27, 1944. She was a gravida i, para o, six months pregnant, and the date of the last menstrual period corresponded to the size of the uterus. The past personal history revealed a normal course during the first four and one-half months of the present pregnancy. In the course of the five to six weeks preceding hospital admission there had developed progressive weakness, occasional nausea and vomiting, inordinate thirst, excessive desire for water, polyuria, and on several occasions during this period she had passed what appeared to be small urinary calculi. No medical investigation of these symptoms had been undertaken by her physician. On the advice of a second physician, hospitalization was effected at once.

Conjoint admission examinations by an urologist, internist, and obstetrician disclosed an acutely ill primigravida with a flushed appearance, dry lips, and moderate exophthalmos. The temperature was 98.6° F. The heart sounds were of poor muscular quality, regular, rate 108. She was in a state of collapse, intermittently disorientated, and her blood pressure was 64/48. The internist thought the left kidney palpable and the right not palpable. There was no anuria, 21 ounces of urine being obtained by catheterization. Occasional twitchings observable in her face were considered of uremic causation. Fetal heart tones were regular, 144, in the right lower quadrant. The consensus was that the patient's condition was too grave to warrant investigation by x-ray, cystoscopy, etc., or induction of labor.

The diagnosis was uremia due to pyelonephritis. Polycystic disease of the kidneys was considered. Circulatory stimulation, intravenous glucose injections, penicillin, and other supportive measures were administered. All these were maintained for the next three or four days, until Oct. 31, 1944, when she was delivered in a stuporous condition, after artificial rupture of the membranes and a short labor, of a six months' living female infant which expired four hours later. A brief interval of about two hours of apparent improvement that followed delivery soon gave way to a comatose state in which the patient expired eighteen minutes after her fetus (Nov. 1, 1944).

On Oct. 28, 1944, hemoglobin was 85 per cent; on October 31, it was 118 per cent; red blood cells, 6,040,000; white blood cells, 23,200; polymorphonuclear, 94; staff, 26; segmented, 68; lymphocytes, 3; mononuclears, 3. Blood chemistry findings on October 27 were: glucose, 116; urea nitrogen, 150; creatinine, 3.0. On October 30, urea nitrogen, 180; creatinine 4.5. The temperature was 98° to 99° F., from the time of admission on October 27 until November 1 when it showed a premortal rise to 103.6° F. The blood pressure varied between 64/48 on admission and 48/20 on her last day.

A complete postmortem examination was made. Of particular interest are the kidney findings, which follow:

"Both kidneys are palpated and are felt to resemble bags filled with stones. Parenchyma is relatively thin. Calculi can be felt to move beneath the palpating fingers. Both kidneys are approximately equal in size. The left kidney measures 12 by 6 by 3.5 cm. and weighs 150 grams. The capsule strips easily exposing a smooth pink cortical surface. On section, the greater part of the kidney is seen to be occupied by numerous calculi varying in size from a pinhead to a small grape. They are all brownish in color and have a pumicelike appearance. There are approximately 1,000 stones in each kidney. The calices are dilated and many of the calculi lie in little pools of pus which tend to be confluent. The cortex and pyramids

comprise a relatively thin wall, measuring 5 to 10 mm. in thickness. They are poorly differentiated from each other. The color is pink. Serial section through the kidney results in finding calculi usually of pinhead size deep in the parenchyma. Stones are found in the pelvis of the kidney and gravel is found in the upper portion of the ureter. The ureter is unobstructed and of constant caliber throughout.

"The right kidney has the same measurements approximately as its fellow and presents a picture quite similar.

"Pelvic organs: The bladder contains a few cubic centimeters of urine. Its wall is thin. The mucosa shows focal areas of injection, but no ulceration.

"The uterus and adnexa weigh 670 grams. The former is the size of a six months' gestation, and is thick and boggy. The endometrial lining is ragged and hemorrhagic, having recently been deprived of the placenta.

"The other postmortem findings are not noteworthy.

"Pathological diagnosis: Bilateral obstructive calculous pyonephrosis with uremia associated with pregnancy; puerperal uterus; splenomegaly and hepatomegaly due to chronic passive congestion, hypostatic congestion of the lungs.

"Cause of death: Calculous pyonephrosis with renal insufficiency."—*J. M. Ravid, Pathologist.*

A direct postmortem radiograph of both kidneys, demonstrated at the general staff conference of this hospital, was of striking appearance due to the myriads of calculi.

This case demonstrates the possibility that massive calculous disease of both kidneys may by its insidiousness escape clinical recognition. Pregnancy was contraindicated and its continuance doubtless hastened the inevitably fatal uremic outcome. The futility of any therapeutic measures is emphasized by the postmortem findings without which the hopelessly pathologic condition of the kidneys would not have been determined.

CASE 2.—C51309, B. L., a white woman, aged 25 years, housewife, was admitted to the hospital on Dec. 25, 1943, because of pre-eclamptic toxemia. Her last menstrual period began on May 28, 1943, and the size of the uterus substantiated a six and one-half months' gestation. The first four months of pregnancy were normal. During the fifth month she travelled out of town, gained 14 pounds, and her blood pressure rose from 110/76 to 155/90. She stated that there was no albuminuria. Dietary restriction had been advised. In the course of the next week she gained 9 pounds more, making a total gain of 23 pounds in the past five weeks. She then returned to this city. Examination disclosed marked generalized edema, distorted facies, blood pressure 178/86, and 4 plus albuminuria. She was hospitalized the same day.

Hospital admission examination confirmed these findings and showed also a regular fetal heart rate of 140 above the symphysis. A pre-eclamptic medical regimen was instituted with the intention of inducing labor if a satisfactory response was not obtained.

In the course of the next three days (December 26, 27, and 28) improvement apparently followed. The edema lessened, being almost gone in the legs, the blood pressure declined to 150/86, the fetus continued viable, subjective improvement was noted, but albuminuria persisted at 3 plus. The next day, however, the blood pressure rose to 176/100, but the edema was still less. On December 30 and 31 the blood pressure rose to a height of 184/108, the edema, particularly in the face, increased, and the albuminuria remained at 3 plus. On the latter date she complained of severe heartburn and several times vomited a dark-brown fluid and blood. Induction of labor, therefore, was attempted that day by rupturing the membranes, inserting an intrauterine tube, and packing the vagina. The next day (Jan. 1, 1944), after several hours of irregular contractions, active labor was in progress. The tube and packing were removed. Profuse coffee-ground vomitus was noted several times that day. On January 2, while in active labor, an initial convulsion occurred at 4:45 A.M., to be followed by a second at 6 A.M. Her blood pressure at the time was 182/120, breathing stertorous, and coma persistent between seizures. Rectal examination showed the cervix 1 finger dilated, head at spines, and the anal sphincter patulous. Her general condition was not very good. At 8 A.M. she was still comatose and minor convulsive movements occurred repeatedly.

Uterine contractions recurred at two- to three-minute intervals. Her pulse was scarcely perceptible. Despite adequate morphinization, a third severe convulsion at 8:15 A.M. supervened. Suddenly she became extremely pale and, within fifteen minutes, expired.

Neither the hematological nor blood chemistry reports are informative. As in Case 1, a complete postmortem examination was made. The findings pertinent to the toxemia are unusual and only these are submitted:

"The abdomen is enlarged by a pregnant uterus corresponding to about six and one-half months' gestation. On vaginal examination the cervix is found to be 2 fingers dilated. The presenting part is engaged. On opening of the peritoneal cavity free and clotted blood is found in the abdomen, the amount being estimated to be about 500 c.c. The uterus and adnexa are carefully inspected and present no bleeding point. After removal of the blood, the liver surface presents a most remarkable picture. Over the left lobe, the capsule is somewhat lifted off the liver surface by a large palm-sized subcapsular hematoma. At one point near the liver margin the capsule is broken and blood oozes into the abdominal cavity. The rest of the liver surface is diffusely covered by confluent hemorrhages, giving the liver surface a yellowish, dark-red, mottled appearance.

"The liver weighs 1,120 grams as previously described, Glisson's capsule over the left liver lobe is lifted off the liver parenchyma by a large subcapsular hematoma, and at one place near the left lower liver margin, the capsule is broken and permits the subcapsular accumulation of the blood to ooze into the abdominal cavity. Scattered over the liver surface other much smaller hematomas (partly confluent but not attaining more than pea size) are seen. The liver parenchyma itself shows its original yellowish-brown color practically wiped out by diffuse, confluent, hemorrhagic streaks, and plaques. The areas intervening between these hemorrhages are distinctly yellowish in color. On section, a similar appearance is seen on the cut surface. The usual lobulated architecture can hardly be made out as the picture is dominated by confluent hemorrhages with areas of yellowish necrosis interspersed.

"The serosal surface of the gall bladder is mottled with hemorrhages.

"The uterus is the approximate size of a watermelon corresponding to about six and one-half months' gestation. The uterine wall is intact. The uterus is opened anteriorly and a female fetus is delivered. The latter measures 40 cm. in length. The placenta is attached to the uterine fundus and shows grossly no evidence of infarction.

"Pathological diagnosis: Diffuse hemorrhagic necrotizing hepatitis, as seen in eclampsia gravidarum, massive subcapsular hemorrhage of the liver, gravid uterus with female fetus of about six and one-half months' gestation in situ, tubal nephrosis, focal myocarditis (toxic variety)."—*J. M. Ravid, Pathologist.*

Since profuse intra-abdominal hemorrhage originating in the liver as an immediate cause of death in eclampsia is rare, this case merits a report. The paramount value of the postmortem examination is obvious since massive subcapsular hematoma of the liver with perforation was not suspected ante mortem.

Appreciation is hereby acknowledged to Dr. William Cantor who referred the first case, to Dr. Harry Lichtman who referred the second, and to Drs. Joseph Rosenthal and Emanuel Salwen who saw the first case in consultation.

PREGNANCY COMPLICATING MULTIPLE SCLEROSIS

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IT IS a well-established clinical fact that multiple sclerosis is frequently made worse by pregnancy. Since more than 40 per cent of the recognized cases of multiple sclerosis occur in women, and since its incidence is highest in persons between the ages of 20 to 40 years, it seems reasonable to suppose that the condition would be observed not too rarely with pregnancy as a complicating factor.

The first comprehensive survey of the subject was published by von Hösslin.¹ It was his opinion that the condition underwent distinct exacerbation throughout pregnancy. The next report was published by Beck.² This author reported a series of 118 patients with multiple sclerosis, 40 of whom had borne babies. Five cases had been diagnosed as multiple sclerosis prior to conception, and all of these showed exacerbations during or immediately after pregnancy. Dimitz³ quotes an analysis of 445 cases of multiple sclerosis collected from the literature by Kortum. Pregnancy had an adverse effect in approximately 20 per cent of these cases.

The literature is singularly silent on the effect of multiple sclerosis on pregnancy, labor, and the puerperium. Peckham,⁴ citing two cases, says: "If the condition is far advanced or is progressing more rapidly since the onset of gestation, abortion should be advised. If the disease is in its early stages and shows no evidence of exacerbation, the pregnancy may be allowed to continue. The labor should be conducted in the most conservative manner." Birner⁵ reports a case of pre-existing multiple sclerosis where pregnancy produced an improvement in some of the neurological symptoms after delivery.

The following case is of interest because of the improvement of neurological signs after delivery.

Case Report

F. F., aged 37 years, white, married, gravida ii, para 0. In 1940, four months after an automobile accident, she developed gradual weakness and difficulty in walking. She began progressively to lose control of the coordinated movements of both legs. Neurological examination at that time (Dr. Nathan Savitsky) revealed the following positive findings: tongue deviation to the left, absent abdominal reflexes, spasticity and weakness of both extremities with a positive Babinski on the left side, bilateral nystagmus. Examination of the eyegrounds revealed bitemporal pallor. Laboratory findings were essentially negative. Serological tests for syphilis were negative.

Her condition remained stationary. In 1942 she had spontaneous miscarriage in the fourth month. Following this another neurological examination showed the same findings as before.

She first came under my observation in August, 1942. She was then three months pregnant. Her last menstrual period had been May 3, 1942, and her expected date of confinement, therefore, was Feb. 10, 1943. The neurological findings at this time were: marked nystagmus, intention tremor, absent abdominal reflexes, and spasticity and weakness of both extremities. Her prenatal course was unusually normal.

Labor started Feb. 2, 1943, at 2:00 A.M., and she was admitted to The Bronx Hospital (case No. 142608). Under a Gwathmey analgesia the cervix became fully dilated at 7:30 P.M. She was delivered by low forceps of a living 9-pound male child after one hour in the

second stage under ether anesthesia. The baby was perfectly normal. The postpartum course was uneventful and the patient left the hospital on the tenth day.

Three months later, a postpartum examination noted the following neurological changes for the better: nystagmus only slight in the lateral position, increase in strength on the left leg, intention tremor much less pronounced.

In March, 1945, two years following the delivery of her baby, she returned for a vaginal discharge due to an eroded cervix. Examination showed no progression in the neurological findings.

Comment

A case of pregnancy complicating multiple sclerosis is reported.

The occurrence of pregnancy was two and one-half years after the onset of the multiple sclerosis.

The neurological condition was improved following the delivery and has remained so for two years.

I am grateful to Dr. Meyer Rosensohn, Attending Obstetrician, The Bronx Hospital, for his helpful suggestions in the preparation of this report.

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1840 GRAND CONCOURSE

DYSTOCIA DUE TO PELVIC KIDNEY

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PELVIC kidney has long been recognized as one of the rare causes of dystocia. Huter,¹ in 1880, reported the first case in literature, and Cragin,² in this country, in 1898, reviewed five previously reported cases and added one of his own. Since then, many case reports of pelvic kidney have been published but the factor of dystocia is so rare as to merit the reporting of the following case:

A 20-year-old primigravida was first seen in the prenatal clinic of AAF Regional Hospital, Truax Field, Nov. 8, 1944. Her last menses occurred March 10, 1944, making the expected date of delivery Dec. 17, 1944. The past menstrual history was normal and the history of past illness was not remarkable.



Fig. 1.

The general physical examination revealed no abnormalities. The fundus uteri was enlarged proportionately to that of thirty-four weeks' gestation. The presentation was sacral right anterior and the fetal heart tones were normal. The external measurements were compatible with a roomy pelvis; the outlet was normal. Since the pregnancy was but six weeks from term at the time of the first examination, no vaginal examination was done. The blood pressure, urine, and symptomatology remained normal during the follow-up examinations and the routine blood study showed no abnormalities.

The presentation remained breech during the remainder of pregnancy, and the patient went into labor Dec. 27, 1944. The pains were never very hard, but the cervix dilated nicely and, after ten hours, rectal examination revealed almost complete dilatation. The breech remained high, and a foot could be palpated through intact membranes. In the hollow of the sacrum could be palpated a firm, smooth, slightly lobulated mass which was interpreted as the buttocks of the baby. Because of an apparent delay in descent of the breech a vaginal examination was done. This revealed that the membranes were protruding through an almost completely dilated cervix. In the hollow of the sacrum could be felt a firm slightly notched mass which was fixed. The borders of the mass could not be outlined but it was estimated to be about the size of the first. It was not part of the breech because the mass lay posterior and slightly inferior to the posterior margin of the cervix.

A tentative diagnosis of ovarian tumor in the hollow of the sacrum was made. It was decided that breech delivery from below was impossible because of encroachment on the pelvic cavity by the tumor. Accordingly, preparations were made for cesarean section. X-ray films revealed normal fetal skeleton with the fetus in complete breech presentation. The tumor could not be visualized. The fetal heart tones were good, the membranes intact.

A low cervical cesarean section was done under spinal anesthesia, because the patient had an upper respiratory infection. A normal baby girl, weighing 6 pounds 14 ounces, was delivered, and cried at once. After the uterine incision was closed, the corpus was delivered from the abdominal cavity and the cul-de-sac explored. In the hollow of the sacrum just below the promontory was a firm ovoid mass, slightly flattened, and attached at one edge. Its color was pale pink. The origin of the mass at first seemed obscure since both ovaries were normal. Palpation of the left renal fossa revealed no kidney present. It was assumed then that the mass in the pelvis was an ectopic kidney. The uterus was replaced and the abdominal incision closed. The postoperative course was entirely uneventful, the highest temperature being 99.4° F. The mother nursed her baby. On the tenth postoperative day a retrograde pyelogram revealed normal right kidney and ureter. The left kidney was visualized in the pelvic cavity (Fig. 1). The ureter was about half the normal length. Both kidneys had normal function with no evidence of infection. The mother and baby left the hospital on the fourteenth postpartum day in good condition.

Appreciation is expressed to Lt. Colonel Bernard B. Larsen, M.C., for his assistance in making the diagnosis of pelvic kidney at the time of operation, and to Captain William E. Forsythe, M.C., for the excellent pyelography.

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SUBCUTANEOUS THORACOPLASTY ON THE PARTIALLY DELIVERED IMPACTED FETUS: A SUBSTITUTE FOR EMBRYOTOMY

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New London, Conn.)*

A RATHER obese 39-year-old white para xii was admitted to the hospital in labor, June 7, 1944, about two weeks after the expected date of her delivery. Two years previously she had delivered a 9-pound baby spontaneously.

After a tedious labor, the very large fetus was delivered by breech extraction to a point where the lower thorax was out, but farther progress could not be made. So tightly did the fetus fill the birth canal that not even a finger tip could be introduced anywhere between the fetus and the walls of the canal. The fetus was dead.

Rather than take the fetus apart to accomplish its removal, a novel expedient was employed, an adaptation of thoracoplasty. Allowing the fetus to hang without support and using standard suture scissors, a two-inch incision was made parallel and close to the left costal border into the abdominal cavity. The first and middle fingers of the left hand were slipped between the skin and the thoracic cage up to the axilla, and then working the scissors between these two fingers the ribs were divided up to the axilla. The hand was withdrawn, and when pressure on the chest was made, it collapsed enough to permit introducing the hand far enough to reach the anterior shoulder of the fetus. With the assistance of a blunt hook the anterior arm and shoulder were brought out and then the other shoulder was delivered. The head was delivered with Piper forceps.

After delivery the baby weighed 12 pounds, $3\frac{1}{2}$ ounces and the thorax resumed its normal contour, with only a 2-inch incision at the left costal border.

The advantages of the procedure were:

1. Facility of execution, about five minutes from the start of the procedure to the completion of the delivery.
2. Avoidance of mutilation of the fetus.
3. The cut bones were completely covered by the undivided skin of the fetal thorax, so that neither the maternal soft parts nor the hands of the operator were damaged.

230 THAMES STREET

A NEEDLE SHIELD FOR CONTINUOUS SPINAL ANESTHESIA DURING LABOR AND DELIVERY

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CONTINUOUS spinal anesthesia for obstetrics and general surgery without the necessity of a special mattress or table has been proved successful at this hospital by using a simply constructed needle shield which will fit the back of any patient.

The needle shield, which makes continuous spinal anesthesia practical for the first and second stages of labor, with the patient in her own bed or on the delivery table, in any position desired, is simple in construction.

The shield, shown in Fig. 1, is bent to form from a sheet of galvanized iron, and measures 9 inches in length and $3\frac{1}{2}$ inches in width at the base. The flange which lies against the back is lined with a strip of felt. It is slightly curved in its entirety and measures 1 inch from the top of the felt lining to its greatest depth. The central portion of the base has a slightly indented area measuring $2\frac{1}{2}$ inches in diameter. The shield is designed for use with a malleable spinal needle.

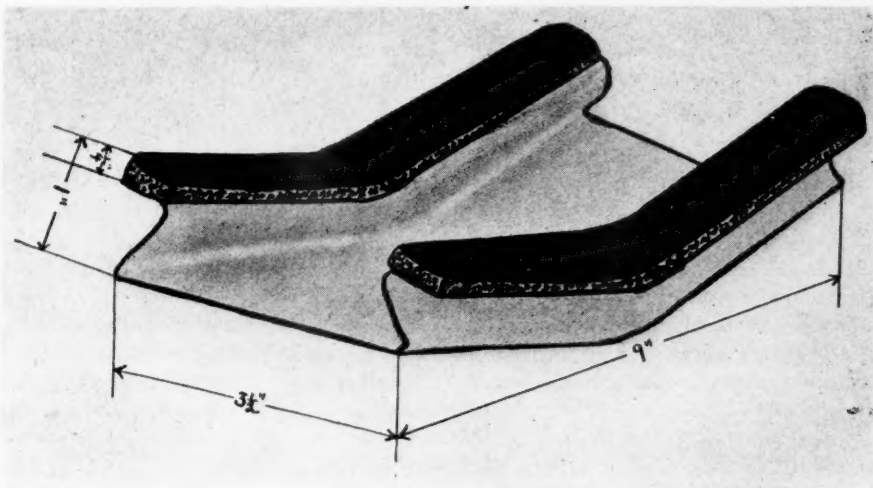


Fig. 1.

After making the spinal tap with a 19 gauge malleable spinal needle in either the sitting or lateral position, the stylet is removed and the regular continuous spinal rubber tubing of 2 c.c. capacity with a Luer-Lok connection is attached to the needle. The tubing, previously filled with anesthetic solution, has a one-way stopcock with a 10 c.c. Luer-Lok syringe attached to its opposite end.

The needle is then bent at right angles one-quarter to one-half inch away from the back and secured with adhesive tape. The needle shield is then placed over the needle and part of the tubing, and secured firmly to the back by placing adhesive tape along the undersurface of the felt-lined flange. The patient is then free to turn on her back or side at will, minus the imminence of dislodging the needle or the shield.

To permit the patient complete freedom of movement, the syringe may be detached from the tubing and a Luer-Lok metal tip from a broken syringe may be attached to the

*Now at the South Baltimore General Hospital, Baltimore, Md.

shutoff stopcock. This metal tip must have a drop of solder placed inside where the glass barrel formerly was so that it can keep the stopcock sterile and at the same time prevent any outflow of spinal fluid should the stopcock accidentally open.

Fig. 2 shows the needle shield under the patient with the rubber tubing supported against the body with adhesive tape. The sterility of the opening of the stopcock is maintained by the Luer-Lok syringe tip which is attached to the stopcock opening.



Fig. 2.

The shield was originally designed with the idea of applying Lemmon's continuous spinal technique to women in labor while lying in their own beds, but it has meanwhile proved eminently successful on any type of operating table without the use of a special split mattress for any type of surgery where continuous spinal anesthesia is desirable. Since the shield fits comfortably into the lumbosacral curve, it may offer some degree of support to this area when it is anesthetized. This is significant when it is realized that one of the contributing causes of postoperative backache after spinal anesthesia may be the complete relaxation of the muscles and ligaments of the unsupported, anesthetized area of the back.

The following observations gleaned from the work done at this hospital offer several suggestions:

1. The needle shield which was already described makes continuous spinal anesthesia for labor and delivery practicable for the first time.

2. With regard to the type of anesthetic solution used during labor and delivery, an extremely dilute solution produced sensory but almost no motor anesthesia of either the extremities or the uterus. Ten milligrams, or 1 c.c., of pontocaine solution was dissolved in 9 c.c. of 10 per cent glucose solution. At intervals of forty to sixty minutes, 2 or 3 c.c. were injected between the third and fourth interspace. Anesthesia carried to the height of the umbilicus produced little motor anesthesia, and, as a consequence, very little fall in blood pressure was encountered.

American Obstetric Services

THE DEPARTMENT OF OBSTETRICS AND GYNECOLOGY OF STANFORD UNIVERSITY SCHOOL OF MEDICINE

San Francisco, Calif.

THE origin of the Faculty of Medicine of the Stanford University is to be found in the establishment of a medical school in San Francisco in 1858 by a few medical gentlemen earnest in their desire for mutual improvement; anxious to increase their store of knowledge; and, like the true scientist the world over, ever willing, even eager, to import their knowledge to others." They received a charter from the University of the Pacific, Santa Clara, and issued an announcement of lectures for the session of 1859. Dr. R. Beverly Cole was Professor of Obstetrics and Diseases of Women and Children, and Physiology. The announcement stated, "In this course there will be no lack of effort to bring everything pertaining to this department as clearly and practically before the mind of the student as the present state of the science will admit. The lectures will be amply illustrated by colored drawings, many of which have been taken from nature, and also by wet preparations. The different operations in obstetrics will be performed upon a manikin, and the student will be instructed and practiced in the use of obstetrical instruments."

In 1864 the young institution saw fit to suspend its teaching, the Toland School taking its place. The arrangement, however, proved an unhappy one, and in 1870 the men who had accepted professorships at Toland withdrew and reorganized the Medical Department of the University of the Pacific. Facilities for clinical instruction were obtained at the San Francisco City and County Hospital, and in 1871 Dr. Clinton Cushing became Professor of Obstetrics and Diseases of Children.

The following year further changes became necessary in order to obtain more adequate laboratory and classroom space. Relations with the University of the Pacific were severed, and the school became the Medical Department of University City College, although it was also known as the Medical College of the Pacific. That same year Dr. Henry Gibbons, Jr., who had graduated in 1863, became Dean as well as Professor of Obstetrics and Diseases of Women and Children, a post which he retained until 1912. A clear-cut separation of the two divisions of obstetrics and gynecology never occurred, but in 1881 a "special professorship" of gynecology was instituted and Dr. Clinton Cushing was given the chair. In 1899 the teaching assigned to this position was taken over by Dr. George B. Somers, first as lecturer and later as professor, while Dr. Cushing became emeritus in 1901.

The medical school had always been handicapped by the lack of a suitable building, and in 1882 the members of the faculty discussed the possibility of raising sufficient funds for this purpose among themselves. One of them, however, Dr. Levi Cooper Lane, endowed the school with a \$100,000 gift to construct an adequate building, and in 1890 he further contributed for an addition to the original structure. It was located on the corner of Sacramento and Webster Streets and although it has had many renovations in the course of the passing years, it is still the key building of the Stanford Medical School (Fig. 1).



Fig. 1.—Stanford Medical School. To the left is Lane Hospital and the white building to the right is a wing of Stanford University Hospital.

With his first gift Dr. Lane made one condition, namely, that the building be given the name of his late uncle, Professor E. S. Cooper, a pioneer San Francisco physician who had founded the first medical school to function on the Pacific Coast. The faculty remained the same, but the institution from then on was known as the Cooper Medical College.

In those early days clinical facilities were provided by the 450-bed San Francisco Hospital and by the Morse Public Dispensary which had been established in 1870. The latter was maintained by the school for years but eventually was moved to the college building and became the Cooper College Dispensary. A notable advance occurred in 1894 when the generous benefactor of

the school donated a 100-bed hospital which was constructed adjoining the medical school building. The new building was rightly named "Lane Hospital" and is still the basic teaching hospital of the present institution.

In November, 1908, Cooper Medical College transferred its allegiance to the Leland Stanford Junior University. This entailed many changes, such as the construction of a new hospital and arrangements for some preliminary instruction for medical students at Palo Alto. In 1912 Dr. Alfred Baker Spalding assumed control as Professor of Obstetrics and Gynecology and his term of service saw the development of a well-organized department of obstetrics and gynecology and female urology devoted to the care of patients, teaching, and research. Because of ill-health Dr. Spalding was forced to retire prematurely in 1933, and was succeeded by Dr. Ludwig Augustus Emge, who did much to enhance the department's activities, and is now on active overseas duty with the United States Public Health Service.

Teaching Staff

The staff of the Department of Obstetrics and Gynecology is at the present made up almost exclusively of part-time teachers. There are two clinical professors, five associate clinical professors, five assistant clinical professors, one full-time instructor, seven clinical instructors, four assistants in instruction, and one research associate. Of this number six are on leaves of absence with one or the other of the Services of the United States.

Clinical and Laboratory Facilities

The department has clinical facilities at both the San Francisco City and County Hospital and the Stanford-Lane Hospital. These institutions are general hospitals, and at the San Francisco Hospital 18 beds are available for obstetric and 31 beds for gynecologic patients. At Stanford-Lane Hospital there are 15 beds for clinic and 19 for private obstetric patients, and 12 beds for clinic gynecologic patients. An additional 10 single-bed rooms are used for isolation and overflow of obstetric patients. Private gynecologic patients are cared for on the general wards of Stanford Hospital.

An Outpatient Department is associated with the medical school. Gynecologic patients are seen every morning and a prenatal clinic is held on two afternoons each week. In addition, special clinics are held on two mornings for female urology, one for postpartum examinations, two for endocrine problems, and a special Tumor Clinic is conducted on one morning.

In order to obtain a proper perspective of the number of patients attended by the department, it is important to note the great changes which wartime conditions have brought about. It has been especially marked in San Francisco, not only because of new economic standards, but because of a great increase in population due to the influx of men and women of the Service and workers in the various war industries. Since the majority of these newcomers belong to the younger age groups the changes are more marked on the obstetric service. In the period from September, 1937, to September, 1941, there were 1,662 de-

liveries on the Stanford-Lane Clinic service, and in 1941-1945 this number increased to 3,079. A similar change was observed on the private service, with 1,201 deliveries for 1937-1941, and 3,016 for 1941-1945. The gynecologic service likewise shows an increase, but not to the same degree. In 1937-1941 there were 1,362 hospital admissions as compared to 1,471 for the 1941-1945 period.

At the San Francisco Hospital a drop in the number of patients in both services also reflect the economic changes in the community. During 1937-1941 there were 1,393 deliveries and 2,924 admissions on the gynecologic service, as compared to 1,213 and 2,399, respectively, during 1941-1945.



Fig. 2.—The Ruth Lucie Stern Research Laboratory.

In September, 1939, the Medical School acquired the Ruth Lucie Stern Research Laboratory (Fig. 2). It is a modern three-story building located across the street from Stanford Hospital, and a large amount of space was allocated to the Department of Obstetrics and Gynecology. On the first floor the Department has a large animal room and maintains both a rat and a mouse colony. There are also facilities for employing rabbits and frogs for pregnancy tests. Adjacent to the main room is a small animal operating room and a store-room. On the third floor of the building there are four administrative offices, a large room now used as a museum but which can be readily transformed into laboratory space or offices for assistants, a room for research workers, a large darkroom for photographic work, storage space, a chemical laboratory, and a pathologic laboratory. Since 1912 the Department has conducted its own examination of pathologic specimens obtained from the operating and delivery rooms. For instance, during the session 1944-1945, 1,282 specimens were studied and this has been an important feature of both undergraduate and graduate training.

A modern lying-in suite was built above one of the wings of Stanford Hospital and completed in the winter of 1942. Fig. 3 gives the floor plan and de-

tails may be found in the description given by Dr. Anthony J. J. Rourke.* Its main features are two waiting rooms for patients' relatives, four single-bed and one two-bed first stage rooms, a dressing room with sleeping accommodations for attending obstetricians, a small laboratory, sterilizing room, scrub room, and three delivery rooms. One of the latter is for teaching purposes. At one end is a students' gallery completely separated from the delivery room proper by plate glass. Students are able to enter this gallery without going through the unit. An amplifying system, with a microphone in the delivery room and a radio in the gallery, enables the obstetrician to talk to the students.

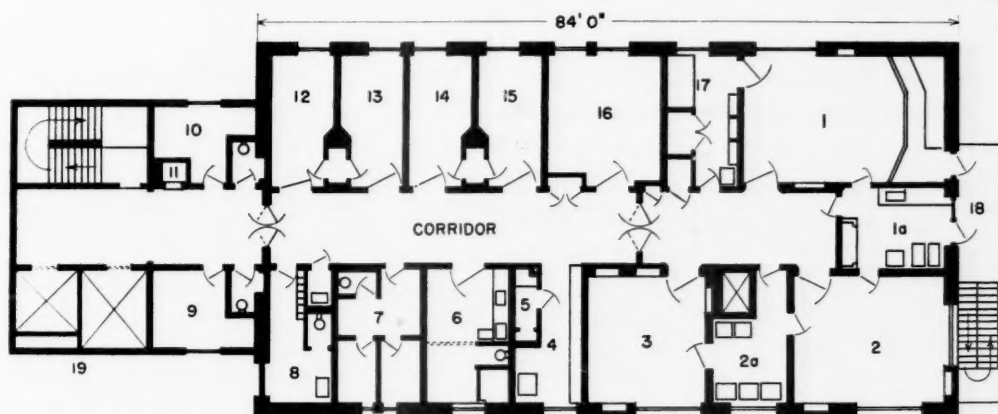


Fig. 3.—Stanford University Hospitals, Lying-in-suite (Jan. 31, 1942.)—Floor plan.

- 1, Delivery room and amphitheater.
- 1a, Sterilizing room.
- 2, Delivery room.
- 2a, Scrub room.
- 3, Delivery room.
- 4, Nurse's station.
- 5, Laboratory.
- 6, Preparation room.
- 7, Doctor's rest room.
- 8, Nurse's locker room.
- 9, Waiting room.

- 10, Waiting room.
- 11, Clothes chute.
- 12, Single-bed labor room.
- 13, Single-bed labor room.
- 14, Single-bed labor room.
- 15, Single-bed labor room.
- 16, Double-bed labor room.
- 17, Surgical supply room.
- 18, Amphitheater entrance.
- 19, Passenger elevators.

Graduate Training

The adoption of the 9-9-9 months' service as a wartime measure has necessarily entailed important modifications in the graduate training offered by the department, but before the war a definite plan was in vogue which made full use of the facilities of the two hospitals. At the San Francisco Hospital the interns are on a rotating service so that they spend a comparatively short time in obstetrics and gynecology, but a full-time assistant resident and a resident are assigned to the department, and at times their duties during the course of a year have been divided between the two hospitals. At Stanford-Lane the regular House Staff consisted of three interns, two assistant residents, and a resident.

During their first year the three interns rotated at specified intervals. They spent four months on obstetrics where they were responsible for the welfare of the clinic patients, with the assistance of two medical students, and under the supervision of the assistant residents. Another term was spent on the

*Modern Hospital 61: 56, 1943.

gynecologic service where they cared for patients admitted to the hospital and assisted at both clinic and private operations. The third period of four months was spent mostly in the outpatient department but entailed training in anesthesia, both in the operating and delivery rooms.

The two assistant residents divided their year between the two sections of the department. While on obstetrics they assisted at all the private deliveries and supervised the interns in the clinic. On their term of duty with the gynecologic service they acted as first assistants on both private and clinic patients.

In the third year of training (and sometimes during the second) the candidate for a future residency was encouraged to leave the department for a year's service in pathology, general medicine, or surgery. The fourth year found the trainee as Resident and given as much control of the clinical and laboratory facilities of the department as possible, but always under supervision. In later years, Dr. Emge made an innovation when a desirable resident was kept on the staff as a full-time instructor for an additional year, and this proved a very wise move both from the standpoint of the doctor concerned as well as of the department.

C. FREDERIC FLUHMAN, M.D.

Necrology

OLIVER PAUL HUMPSTONE, prominent gynecologist and obstetrician of Brooklyn, New York, died at his home in Amsterdam, New York, on January 23, after a long illness, at the age of 70. After graduating from the College of Physicians and Surgeons of New York in 1899, he interned at the Methodist-Episcopal Hospital in Brooklyn, and steadily advanced until he became head of the department in 1915 and remained as such until his retirement a few years ago. Dr. Humpstone was also associated as consultant with several other hospitals and a prominent member of various local societies.

A competent and able clinician, an inspiring teacher, and an active practitioner for many years, Dr. Humpstone is to be credited with the development of the maternity service at the "Seney," which has grown into an important activity in the Borough of Brooklyn.

Department of Reviews and Abstracts

Selected Abstracts

Placenta

Ware, H. Hudnall, Jr., Winn, W. C., and Schelin, E. C.: **Premature Separation of the Placenta**, South. M. J. 37: 163, 1944.

There were 175 cases of premature separation of the placenta in 13,441 deliveries at the Medical College of Virginia, an incidence of 1:73. Of this group 59 were severe. These were characterized by sudden onset with prompt disappearance of the fetal heart sounds quickly followed by maternal shock. It is thought that this type of separation probably begins near the center of placental attachment and therefore external bleeding may be scanty or delayed. The treatment for this type in 42.3 per cent was a cesarean section with or without hysterectomy, depending upon the degree of hemorrhagic infiltration into the myometrium. There were 116 mild cases. In this group 95.7 per cent had vaginal deliveries. Cesarean section in this group was reserved for those with pelvic dystocia, long undilated cervixes, or where it was imperative to control a profuse hemorrhage. Following delivery the uterus was packed in 9.4 per cent of the mild group and 33.8 per cent of the severe group. Transfusions were given in both groups when indicated.

The relationship of toxemia to premature separation is well established, occurring in 53.9 per cent of the severe group and 22.4 per cent of the mild group. External hemorrhage occurred in 91.5 per cent of the first group and 82.7 per cent of the latter group. History of trauma was obtained in 3.2 per cent of the entire series. Careful analysis of the case histories reveals that both the mild and severe group occurred more frequently in patients near term. However, the complication may be seen as early as the twenty-second week of pregnancy. Fifty-four per cent of the separations occurred during labor, and in 34 per cent the onset of labor occurred soon after the separation. Artificial induction of labor by the rupture of the membranes was performed in only 33 patients.

There was an uncorrected maternal mortality of 3.4 per cent. All deaths occurred in the severe group. It is worth noting that the mortality from vaginal deliveries was 14.7 per cent and in cesarean sections 4 per cent. Fetal mortality in the severe group was 91 per cent and in the mild group 46 per cent. Of the six patients who died, only one was delivered by cesarean section. This patient died with anuria on the second postoperative day and the autopsy revealed interstitial nephritis. Five patients died following vaginal delivery. Four of these died of hemorrhage despite uterine and vaginal packing. The fifth patient died within one hour after delivery without transfusion or packing. It is suggested that more massive transfusion followed by early hysterectomy may have salvaged some of these patients. Autopsy performed on two of the patients delivered vaginally showed extensive extravasation of blood in the myometrium.

WILLIAM BICKERS.

Pregnancy, Diagnosis, Physiology, etc.

Murray, John: **Rh Antenatal Testing. A Suggested Nomenclature**, Lancet 247: 594, 1944.

Murray describes a modified technique for Rh testing, using smaller test-tubes (2.0 by 0.2 inch), Wright and Colebrook throttled pipettes, and a multiple grooved slide.

After the series of 200 consecutive unselected antenatal mothers were ABO grouped, and found to be a representative sample of the populace, the author proposes a new nomen-

elature for describing the Rh groups. He names the cells after the sera with which they react and thus records the phenotype of cells in this manner: rh (Rh₁); Rh₁ (Rh₁₃); Rh₂ (Rh₂₃₄); Rh₁Rh₂ (Rh₁₂₃₄); Rh₀ (Rh₃₄); Rh' (Rh₁); Rh'' (Rh₂₄); Rh'Rh'' (Rh₁₂₄); Rhy (Rh₁₂) and Rhz (Rh₁₂₃).

Murray contends that the antenatal Rh testing must do more than simply detect Rh-negative mothers, which is easily performed by the finger prick and only 2 sera; anti-Rh' (1 + 3) and anti-Rh'' (2 + 3) - with no test of patient's sera for antibodies. The more complete examination for genetic make-up and the presence of antibodies will ultimately be of valuable clinical assistance, as will an examination of the husband's cells when the mother is Rh₁ (Rh negative), to enable us to forecast possible genotypes of the unborn infants and the likelihood of incompatibility. (When a greater series of tests are performed, for statistically more accurate results, the author hopes to correlate these clinical and serologic findings.)

The author's Rh tests showed that 12.5 per cent of 200 unselected consecutive antenatal mothers were Rh negative and that 2 of the 25 Rh-negative had anti-Rh antibodies.

CLAIR E. FOLSOME.

Pregnancy, Complications, etc.

Browne, Francis J.: The Significance of Signs and Symptoms in Toxaemia of Pregnancy, Edinburgh M. J. 51: 449, 1944.

In the September, 1944, Honeyman Gillespie Lecture, delivered in the Royal Infirmary, Browne initiated his paper by recounting his results from posing three written questions to seven prominent and experienced London obstetricians. In each instance the experienced man was to answer each question without consulting anyone or any literature.

The questions bear repetition:

1. Does edema, either clinical or occult, always precede hypertension?
2. Does toxemic albuminuria ever precede hypertension?
3. Does toxemic albuminuria ever appear before edema?

Browne found the replies showed little agreement. With this introduction, the author then considers the triad of signs or symptoms, to see if he can arrive at a conclusion regarding their meaning or genesis.

In the consideration of edema the author reviews the theories of its genesis, the anti-diuretic hormone, hypoproteinemia, increased capillary permeability, increased venous and capillary permeability, and the role of the sex and other hormones. In the latter possible etiological theory, Browne states: "It is curious that but little attention has been paid to the hormones of the adrenal cortex." He reaffirms that edema is best controlled and even prevented by limiting the intake of common salt.

Browne summarizes the evidence, pointing hypothetically toward the unknown factors causing hypertension of pre-eclamptic toxemia. We can say (1) it is due to humoral, not a nervous mechanism; (2) it is not due to renal ischemia however produced; and (3) the pre-eclamptic candidate, after the third month of pregnancy, acquires a sensitivity to the action of pressor substances which is not due to any constitutional predisposition.

Albuminuria, the least important of the cardinal signs of pre-eclamptic toxemia in Browne's opinion, does not precede hypertension or edema. He regards the albuminuria as rather an effect than a cause and condemns the phrase "albuminuria of pregnancy."

Browne concludes that the antenatal clinic and care of the expectant mother furnish unparalleled opportunities for observation and investigation of the genesis and development of the toxemias of pregnancy.

CLAIR E. FOLSOME.

MacLennan, Hector R.: Contracted Pelvis in Childbirth: A Study of Its Morbid Effects on Mother and Child (The Blair-Bell Lecture, 1944), J. Obst. & Gynaec. Brit. Emp. 51: 293, 1944.

This Blair-Bell Memorial Lecture reviews a previous report regarding the geographical distribution of contracted pelvis in Scotland and analyzes the outcome of labor in a series of

1,049 cases from the standpoint of the toll of maternal and fetal life taken by contracted pelves. Rickets is considered to be the chief etiological factor for major and minor degrees of contracted pelves, and congenital or developmental morphologic variations are thought to be of secondary importance. This opinion was not gained by the use of roentgenologic methods of examination.

One of the striking features is the dystocia caused by slight degrees of contraction. There were 31 craniotomies and 53 high forceps operations. The stillbirth and neonatal death rates are high even though these cases were under the care of experienced obstetricians. The maternal death rate for the series was 21 per 1,000 (22 in 1,049). In the normal control group it was 3 per 1,000.

These results justify the importance of instituting adequate health measures to prevent the development of rickets in the growing child and the need for clinical and roentgenologic methods of examination for the early recognition of the abnormal pelves. While the author believes it is extravagant and impractical to request a roentgenologic examination for every expectant mother, the value of roentgenologic methods is admitted. A roentgenologic examination with expert interpretation is advised for all primigravidas when the head has not engaged by the end of the thirty-sixth week. Multigravidas who have required instrumental deliveries should be regarded with suspicion, even when deliveries have been effected successfully, because increase in child weight may introduce hazards at any time with the slightly contracted pelvis. Hence the early recognition of the degree of pelvic contraction is urged in order to institute the proper treatment.

HOWARD C. MOLOY.

Puerperium

Palacios Costa, N., Pastorini, R., Jamardo, N., and Di Leo, A.: Vaginal pH During the Puerperium, An. ateneo Inst. mat. y asist., 363-366, 1943.

The authors studied 54 women and found that those with a febrile puerperium had high pH values. The lowest pH was 4.7 and the highest 7.7, while the respective extreme temperatures were 36.2° and 38.8° C. This coincidence is an important finding, and further studies are needed to elucidate the reasons why the vaginal pH increases with the temperature of the body.

J. P. GREENHILL.

Abad, Ramon S., and Peiretti, Francisco S.: Permanent Enlargement of Pelvis After Symphysiotomy, An. ateneo Inst. mat. y asist., 85-122, 1943.

The authors found this condition in 100 per cent of 35 women studied roentgenographically. The separation was not over 2 cm. in 57 per cent, and was about the same as that found by digital examination at the time of labor in 43 per cent.

One woman had a separation of 5 cm. due to a fall with the legs spread apart subsequent to the symphysiotomy; after disappearance of the pains and urinary disturbances resulting from the accident, there remained only an anterior and posterior colpocele which was successfully operated upon.

Another woman, who had two spontaneous deliveries since her symphysiotomy, presented a separation of 4.5 cm. when examined for a new pregnancy. This enlargement was greater than that obtained at the time of operation.

A separation of 3.5 cm., associated with difficulty in walking and pains in the sacral region, was reduced to 2.5 cm. with disappearance of the disturbances, by bed rest and a compressive bandage round the pelvis.

J. P. GREENHILL.

Radiation

Corscaden, James A.: An Evaluation of Radiation in the Treatment of Carcinoma of the Corpus Uteri, J. A. M. A. 126: 1134, 1944.

The author discusses the various methods that have been used in the treatment of carcinoma of the corpus uteri and some of the improvements in the more recent methods of

treatment. The use of hysterectomy alone or radiation alone or a combination of the two is discussed. All three methods are essential in operable carcinoma of the uterus. Hysterectomy alone promises only a 60 per cent five-year survival rate, and fails because of recurrences. The author's general conclusion is that x-rays have a definite cancerocidal effect and, while at present incompletely effective when used alone, should be considered as essential in the treatment of corpus carcinoma. Radium alone promises a five-year survival of 55 per cent, but, because of its local effect, fails to destroy cells lying deep in the myometrium and in metastasis in the adnexa. When a combination of these two methods is used, there has been a five-year survival rate of 70 per cent. It is felt that the employment of present-day techniques promises a five-year survival of 80 per cent.

WILLIAM BERMAN.

Sterility, Fertility, etc.

Grabill, Wilson H.: Effect of the War on the Birth Rate and Postwar Fertility Prospects, Am. J. Sociol. 50: 107, 1944.

A record of 3,100,000 babies were born in 1943. This will probably be reduced to 2,640,000 in 1944, and will continue to decline until the end of the war when a temporary peak will be followed by another decline. In the first World War, there was a rise during the first year which was soon arrested and a rapidly falling birth rate occurred during the latter years of World War I. The effects of World War I on birth rate continued until 1940. Military casualties and privations by civilian population contributed to this decline. A large factor, however, was the determination on the part of most people to limit family size. In the United States, birth rate tends to follow economic and political changes, although there has been an over-all decline in birth rate since the beginning of this century. The fluctuations have continued to parallel the rise and fall of economic conditions. The birth rate in this country has already passed its wartime peak and will continue to fall until the end of the war, reaching a low point of perhaps 16 births per thousand population. Immediately after the fall, a temporary revival is expected, but in the long run, the postwar trend will again be downward.

WILLIAM BICKERS.

Vaginal Infections

Compton, B. C., Bieren, R. E., Inloes, B. H., Kardash, Theodore, and Hundley, J. M.: Treatment of Gonococcic Vulvovaginitis, J. A. M. A. 127: 6, 1945.

The authors feel that the smear method of diagnosis is as successful as the culture method in children. This is not so true in adult gonococcc infections. The response to treatment can also be followed by the same method. The patient should be isolated in the home as completely as possible until the discharge has disappeared, and until the smear has become negative. The authors feel that estrogens are the drugs of choice. The sulfonamides have been used successfully both alone and in combination with estrogens. The authors abstain from the use of the sulfonamides because of the danger of sensitization of the patient to these drugs. They should be used for the more serious diseases occurring in childhood, and for some of the complications arising from gonococcc vaginitis. Patients are followed weekly until they have three negative smears, then at monthly intervals until they have been negative for three months, and then at three-month intervals thereafter until the smears have remained negative for one year. The technique of use of the various drugs mentioned is described.

WILLIAM BERMAN.

Fuenzalida, Sergio: Vaginal Trichomoniasis, Bol. Soc. chilena de obst. y ginec. 8: 393, 1943.

The author states that trichomonas is one of the most frequent causes of leucorrhea and has been found in 60 per cent of the patients with this disorder. The best way to discover the parasite is to examine fresh vaginal discharge mixed with 5 c.c. of physiologic salt solution. This must be done within two hours of collecting the discharge; otherwise,

the movements of the parasites decrease, making their recognition more difficult. The most common method of infection is by contact with the discharge of a parasite carrier. Venereal transmission is also possible. Symptoms appear or become worse whenever a change in vaginal pH toward alkalinity takes place.

Fuenzalida has obtained the best results with Devegan and silver picrate. In the first method, the vagina and vulva are irrigated with 1 liter of tincture of green soap and the discharge is removed by cautious use of cotton swabs. The soap is washed out with 1 liter of boiled water and the vagina is dried with cotton. Two tablets of Devegan are placed in the lateral cul-de-sacs. This procedure is repeated for three days and then three times more at intervals of four days. The patient places a tablet in the vagina every night for one month, with the exception of the days on which the treatment is given.

In the second method, the vagina is cleaned in the same manner and dried. Five grams of a 1 per cent mixture of silver picrate in kaolin are pulverized and placed in the vagina once a week for four weeks and the patient inserts into the vagina an ovule of silver picrate (0.13 Gm.) every night of the four weeks. With both methods, intercourse and irrigations are stopped for three months.

J. P. GREENHILL.

Venereal Diseases

Hughes, T. Dixon: *Syphilis in Pregnant Women: A Study Based on the Routine Wassermann and Kahn Tests Performed on 28,924 Patients*, M. J. Australia 2: 265, 1944.

The authors report 160 positive reactions for syphilis among 28,924 patients tested, which gives an incidence of 0.55 per cent. Of these 160 cases, only 134 records are available. One hundred and twenty children were born alive, 8 were stillborn, 4 died in the neonatal period, and there were two miscarriages. All of the above 134 patients had treatment, the adequacy depending upon how early in pregnancy they reported to the outpatient department. These figures lend support to the statement that syphilis contributes to fetal mortality in the last half of pregnancy.

WILLIAM BERMAN.

Rosenblatt, Philip, Meyer, Edda, and Robbins, Lillian: *Statistical Studies in Female Gonorrhea With an Evaluation of Yeast Supplement in Gonococcus Isolation*, Am. J. Syph. Gonorr. & Ven. Dis. 28: 634, 1944.

Conclusions reached are as follows:

1. Proteose No. 3 hemoglobin agar (Bacto) fortified with supplementary factors present in Bacto-Supplement A is superior to chocolate agar alone.
2. Cultures from the cervix uteri are more likely to be positive than cultures from the urethra.
3. The examination of smears for the diagnosis of gonorrhea in the female is unsatisfactory.

C. O. MALAND.

Marciano, G. M. O.: *Influence of Nicolas-Favre Disease on Pregnancy, Parturition and Fetus*, Rev. obst. y ginec. 3: 126, 1943.

The author discusses the above subject with a report of 17 cases. He says that because of the serious aspect that lymphogranuloma has assumed in Venezuela, the problem deserves special study. When pregnancy occurs, it will be carried to normal term in the majority of cases. Disturbances caused by the disease, however, can have serious repercussions on the fetus in some cases, and the mother is not free of risk. The amniotic fluid, in the latent period of the disease, lacks antigenic properties. Intrauterine infection does not occur in mothers who have chronic infection. They produce healthy infants, who develop normally. The Frey reaction is negative in children born of mothers with lymphogranuloma, at least in the latent period of the disease. Because dystocia is frequent with this disease, the patients should be subjected to vigilant observation during labor, and in serious cases cesarean section should be performed.

J. P. GREENHILL.

Malignancies

Aguinaga, A.: Cancer of Bartholin's Gland, Obstet. y. ginec. latino-am. 2: 178, 1944.

The author reports two cases of cancer of Bartholin's gland in women aged 46 and 66 years, respectively. Up to the present time, more than 60 cases of this type have been reported in the literature. Most women with cancer of Bartholin's gland were between 41 and 60 years of age, but cases occurred at 19 and 91 years of age. In most cases the chief symptoms are pain, tumor, and pruritus. According to Honan, four conditions must be fulfilled to diagnose a neoplasm of the vulva as of Bartholin-gland origin, namely: (1) typical vulvar localization, (2) deep penetration in the labium, (3) connection with the gland duct, and (4) presence of intact gland tissue. Schaffer added two more prerequisites, namely, it must be a true adenocarcinoma, and the skin must not be involved.

The prognosis is bad. Metastases appear early. Treatment consists of vulvectomy with one- or two-stage extirpation of the inguinocrural glands and postoperative radiation by roentgen rays.

J. P. GREENHILL.

Cesarean Section

Salzado, C.: Cesarean Section for Diaphragmatic Hernia, An. brasil de ginec. 9: 255, 1944.

The author reports a case of pregnancy in a woman who had a diaphragmatic hernia. At term he performed a cesarean section and sterilized the patient. Six years before becoming pregnant the patient had a lung abscess which healed, and one year before the gestation a phrenicectomy had been done on the left side. The diaphragmatic hernia was discovered when an x-ray plate was taken for gastrointestinal symptoms. Roentgen-ray examination showed that the upper part of the stomach rested within the thorax.

J. P. GREENHILL.

Endocrinology

Leatham, J. H., and Abarbanel, A. R.: Gonadotrophins and the Antihormone Problem, West. J. Surg. 52: 491, 1944.

The combination of human chorionic gonadotrophin with sheep anterior pituitary extract (Synapoidin) is capable of stimulating the human ovary. This product contains protein material which may produce protein reaction. "Antigonadotrophic" substances have been detected in the human being following the administration of equine gonadotrophin. The antagonists may be evoked by the hormone or by the protein material. Chorionic gonadotrophin is not antigenic; however, the sheep pituitary extract may be.

Six patients were injected with the combination of anterior pituitary extract and human chorionic gonadotrophin, and a study was made to determine whether antigonadotrophic substances were produced. Blood serum from these patients was injected along with 3 R.U. of synapoidin daily for three days into 22-day-old female mice. The weights of the ovaries and uteri were obtained after seventy-two hours, when the mice were killed. The average ovarian weight in the sera-synapoidin mice was 6.6 mg. as compared with the ovarian weight of 5.7 mg. in the mice injected with synapoidin alone. It was, therefore, concluded that no antigonadotrophic substance was present in the sera of patients treated with a combination of chorionic gonadotrophin with sheep anterior pituitary extract. WILLIAM BICKERS.

Simpson, Miriam F.: Gonadotropic Hormones With Special Reference to Their Action on the Female Reproductive Mechanism, West. J. Surg. 52: 287, 1944.

Cyclic ovarian phenomena and all dependent activity cease after hypophysectomy in the rat. The follicular apparatus undergoes atresia with the exception of the corpora lutea which, strangely, persist for long periods. All organs related to reproduction, the mammary glands, oviducts, uterus, and vagina, undergo regression. This regression can be reversed by im-

plantation of pituitary tissue as originally shown by Zondek and Smith. It was also shown that the urine of pregnancy contained a gonadotropin similar in its effect on the rat ovary to the pituitary extract itself. From the postmenopausal urine was extracted a gonadotropin which caused follicular growth but not rupture. These observations were apparent on the rat but to a considerably less extent on the primate. The discrepancy is explained on the basis that chorionic gonadotropin is a pituitary stimulant and not a direct stimulator of the ovary in the primate. Reaction of the rat ovary will vary depending on whether the injected hormone is derived from an extract of the pituitary gland (FSH, ICSH, LH) or derived from body fluids such as blood or the urine of pregnancy. Primates have proved extremely resistant to hormones; ovulation cannot be induced with doses successfully given to rats on a comparable weight basis.

WILLIAM BICKERS.

Lurie, L. A.: The Endocrine Factor in Homosexuality. Report of Treatment of 4 Cases With Androgen Hormone, Am. J. M. Sc. 208: 176, 1944.

Homosexuals have usually been divided into two broad groups—overt and latent. The overt homosexual, as the name implies, is one who has committed homosexual acts. The latent is one who has not as yet committed any homosexual act, but whose behavior can be explained only on the basis of repressed homosexual drives. Such individuals, as a rule, sooner or later resort to overt homosexual practices. A better classification, in the opinion of the author, and one that might avoid some of the criticisms directed at the purely psychoanalytic concept of homosexuality, is that of innate and acquired. The psychopathology of acquired homosexuality may be correctly explained on a psychoanalytic basis. The condition of the innate homosexual, on the other hand, can be best explained on the basis of a somatic factor in the form of an endocrine disorder.

Four cases of male homosexuality, varying in age from 13 to 22 years, are presented, all of whom fell into the "innate" group, manifesting secondary sex characteristics approaching the female type. In 3 of the cases hormonal studies showed evidence of an androgenic deficiency. All were behavior problems. Testosterone propionate was administered to each in 25 mg. doses triweekly over relatively long periods of time with striking results. Not only did such physical changes as growth of hair, deepening of the voice, masculine body configuration, etc., take place, but all evidence of homosexuality, emotional disturbances, and delinquencies cleared up as well. The importance of the endocrine factor is stressed, and a psychosomatic approach to the study of homosexuality is suggested.

FRANK SPIELMAN.

Gynecologic Operations

Zumel: Dangers of and Contraindications to Immediate Rising of Operated Patients, Toko-ginec. pract. 3: 153, 1944.

The author believes that gymnastics and early rising are useful for some but that immediate rising is inadvisable for most surgical patients. Early and immediate rising has been made possible by asepsis and local anesthesia. Immediate rising of an operated patient who does not have an arterial pressure close to normal is dangerous. Early and immediate rising is contraindicated in septic surgery of the large cavities.

J. P. GREENHILL.

Colmeiro Laforet, Carlos: Surgery of Senile Prolapse. Kahr's Operation, Toko-ginec. pract. 3: 268, 1944.

During 1943 the author performed this operation on five women whose ages ranged from 60 to 70 years. In all cases of prolapse in which he considers this operation necessary, he routinely gives an intramuscular injection of 10,000 units of estrogen every five days to improve the circulation of the genitalia which show senile involution. The injections are continued until fifteen days after the operation which in no case is performed before the prolapse has been reduced for at least two weeks.

The immediate results were generally good and the prolapsed part was efficiently supported in all cases. The subjective impression of the patients on discharge was uniformly favorable.

The method deserves to be tried extensively. Its superiority over the other methods recommended for similar cases lies in its easy technique, slight operative trauma, and more favorable immediate and probably also late results in a high percentage of cases.

J. P. GREENHILL.

Erratum

In the article entitled "Cesarean Section Mortality," which appeared in the July, 1945, issue on page 41, I wrote "Waters states that most of their extraperitoneal sections are done for teaching purposes." Dr. Waters, in a personal communication, states that I misunderstood him. He had furnished the figures used in the article but they were not broken down. In the June, 1945, issue, Waters stated that of the 250 cases, 90 had pre-operative morbidity or sepsis, leaving 140 presumably clean cases. Correspondence and a personal discussion with Dr. Cosgrove have clarified the indications in the 250 cases, and an additional 233, a total of 483 Waters sections to July 1, 1944. The majority of the operations were performed in potentially or actually infected patients, whom we would have delivered vaginally (if necessary by craniotomy) or by cesarean-hysterectomy. There were 6 deaths, a rate of 1.24 per cent. Five were from infection. The low mortality demonstrates the increased safety of the Waters operation over that of the transperitoneal low cervical. Furthermore, vaginal delivery in patients with dystocia entails an increased mortality for both mother and fetus which has been little, if any, increased by the operation for the former, and certainly decreased for the latter.

WM. J. DIECKMANN, M.D., CHICAGO, ILL.

Item

American Board of Obstetrics and Gynecology, Inc.

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